

**Utah Department of Public Safety  
Driver License Division**

**Commercial Vehicle Driver  
Handbook**



# Section 1: Introduction

## This Section Explains Commercial Drivers License Tests Other Safety Rules

On October 26, 1986, Congress passed the Commercial Motor Vehicle Safety Act of 1986. This law requires each State to meet the same minimum standards for commercial driver licensing. The standards require commercial motor vehicle drivers to get a Commercial Driver's License (CDL). You must have a CDL to operate any of the following Commercial Motor Vehicles (CMV):

- A single vehicle with a gross vehicle weight rating (GVWR) of more than 26,000 pounds.
- A trailer with a GVWR of more than 10,000 pounds if the gross combination weight rating is more than 26,000 pounds.
- A vehicle designed to transport more than 15 persons (including the driver).
- Any size vehicle which requires hazardous materials placards.
- Any size vehicle used as a school bus.

To get a CDL, you must pass knowledge and skill tests. This manual will help you pass the tests.

### Getting Started

First, determine if a Commercial Driver License is required to operate the vehicle you are driving. Many drivers who were required to have commercial type licenses in the past are not required to have the new CDL. Review the CDL handbook or check with the Driver License Division to help you decide. If you need a new CDL, decide which class of license you will need and which endorsements will be required for you to carry various types of cargo.

All drivers of commercial motor vehicles must have a CDL after April 1, 1992. The following information will help you when applying for your license:

- Obtain the necessary study materials for the CDL class and endorsements that you want. You may obtain CDL handbooks from your local Utah Driver License Division office.
- Be prepared and avoid unnecessary delays in obtaining your CDL. Study for your test. A CDL is for professionals and as a professional you will be required to demonstrate your knowledge through a comprehensive written and skill testing procedure. Passing scores usually require about 8 to 12 hours reading and intensive study of the CDL manual.
- **When you are ready to apply for your CDL**, call your local CDL testing station and make an appointment for your test(s). If you are unable to keep your appointment, please call and cancel so another driver can take your place. If you fail to keep your appointment and have not notified the testing office of the cancellation at least 48 hours in advance, you will be assessed a \$25.00 re-scheduling fee.
- **When you appear at the testing facility, the examiner will ask you for the following items:**
  1. Your current driver license.
  2. Your Social Security card or W-2 forms for proof of Social Security number (metal cards are not acceptable).
  3. Your valid DOT medical card, or Medical Long Form.

4. A 3rd party form for the skills test, if applicable.

## **Record Check**

Driver application information will be used to check your Utah driving record and will be used in a check of the nationwide Commercial Driver License Information System, the National Driver's Register and other states' driver records.

## **Only One License!**

It is illegal for you as a driver of commercial motor vehicles to have more than one license. You must keep the license issued by the state in which you live. All other licenses must be returned to the states that issued them.

## **Third Party Testing**

You may take the skills portion of the tests from authorized persons or organizations that have been certified by the Utah Driver License Division. Lists of those authorized are available at any CDL office.

**Out of state Third Party Testing Certificates are not acceptable.**

## **Written Tests**

For a Class A, B, and C license you must take the general knowledge test. For a Class A license, you must take the combination vehicle test. To drive commercial vehicles with air brakes you must take the air brakes test. If you do not take the air brakes test or fail the test you will be restricted to drive vehicles without air brakes. Separate tests are also required for endorsements. The following chart lists the number of questions asked and the time required to take each knowledge test.

| Knowledge Test   | Number of Questions Allow at least |            |
|--|------------------------------------|------------|
| CDL General Knowledge (all drivers)  | 50                                 | 1 hour     |
| Combination vehicles (Class A drivers)   | 20                                 | 20 minutes |
| Air Brakes   | 25                                 | 25 minutes |
| Tank vehicles  | 20                                 | 20 minutes |
| Passenger Transport (also requires a driving skills test in a passenger vehicle) | 20                                 | 20 minutes |
| School Bus (also requires a driving skills test in school bus)                   | 20                                 | 20 minutes |
| Doubles/Triples  | 20                                 | 20 minutes |
| Hazardous Materials  | 30                                 | 30 minutes |

## **Retaking Exams**

If you fail a test, you may take it one more time without any additional costs. If you fail a general knowledge or combination test a second time, you will be charged a \$15.00 re-testing fee which entitles you to two more attempts to pass. Endorsement re-tests are \$5.00 each.

## **Fees**

The cost of a CDL will vary according to the amount of testing required for you to obtain a CDL with the

endorsements your job demands. The CDL testing fees are:

|   |         |
|---|---------|
| <b>Skills Test</b>  | \$50.00 |
| <b>General Knowledge Test</b>   | \$30.00 |
| (Combination vehicles and air brakes if required)   |         |
| <b>Endorsement Tests</b>  | \$5.00  |
| <ul style="list-style-type: none"><li>● Passengers</li><li>● Hazardous materials</li><li>● Tank vehicles</li><li>● School buses</li><li>● Doubles/triples</li><li>● Tanker/hazardous materials</li><li>● Motorcycle</li></ul> |         |
|   | \$7.50  |

**NOTE: All license fees are non-refundable.** Original applications must be completed within six months from the date of application. If the application is not completed within six months an original fee will again be charged before the testing can continue or a CDL license can be issued.

**Physical Examination**

You will be required to pass a DOT physical examination and have your doctor sign a DOT certificate stating you meet federal qualifications. This certificate must be carried with you at all times while you are driving commercially. It must be renewed every two years. Medical forms may be obtained through individual transportation companies, physicians, and exam centers that conduct medical examinations in accordance with the Federal Motor Carrier Safety Regulations. Or, they may be purchased from the Utah Motor Transport Association, 975 W. 2100 S., Salt Lake City, Utah.

**Vision Standards for Commercial Drivers**

In order to operate commercial motor vehicles, you must have:

- 20/40 or better vision, in each eye (corrected or uncorrected)
- field of vision of at least 70 degrees horizontal meridian in each eye, and
- the ability to recognize the colors of traffic signal devices showing standard red, green and amber.

**Commercial Driver Learner's License**

You may be issued a Learner's Permit for any class CDL license if you meet the basic requirements and pass the appropriate knowledge tests. This permit will enable you to legally practice and prepare for the driving skills test. While operating a commercial motor vehicle with a Commercial Driver Lerner's Permit you will be restricted to having a licensed CDL operator with the proper class of license and endorsements, in the front seat with you.

**Minimum Age For Commercial Motor Vehicle Operators**

Federal law requires all commercial motor vehicle operators who Commercial drive across state lines to

be at least 21 years old. Persons between 18 and 21 years of age plus 1 year of driving experience, may be issued a commercial driver's license with a restriction indicating their commercial driving privileges are valid in Utah only (intrastate) and may not transport passengers for hire or hazardous materials (may not obtain a Class C, CDL). Some cargo, although transported only inside the state by a driver may be considered interstate commerce and may not be transported by a driver under 21. If you are younger than 21 and if you are uncertain about your cargo, check with your employer or the Utah Department of Transportation.

The following are exempt from requiring a CDL:

### Exemptions From Obtaining A CDL

- **Recreational Vehicles** used solely as a family/personal conveyance for recreational purposes.
- **Military vehicles** when operated by military personnel, including the National Guard.
- **Farmers** - Operators of farm vehicles that are controlled and operated by the farmer, used to transport agricultural products, farm machinery or farm supplies to or from the farm; not used for hire or contract carrier operations; and driven no further than 150 miles from the farm.
- **Emergency vehicles** - Operators of fire fighting equipment and emergency vehicles operated by a municipality or volunteer fire department.

## 1.1 Commercial Driver License Tests

You will have to take one or more knowledge tests, depending on what class of license and what endorsements you need. The CDL knowledge tests include:

### Knowledge Tests

- The General Knowledge Test, taken by all applicants.
- The Passenger Transport Test, taken by all bus driver applicants.
- The Air Brakes Test, which you must take if your vehicle has air brakes.
- The Combination Vehicles Test, which is required if you want to drive combination vehicles.
- The Hazardous Materials Test, required if you want to haul hazardous material or waste in amounts which require placarding.
- The Tanker Test, required if you want to haul liquids in bulk.
- The Doubles/Triples Test, required if you want to pull double or triple trailers.

### Skills Test

If you pass the required knowledge test(s), you can take the CDL skills test(s). There are three types of general skills that will be tested: pre-trip inspection, basic vehicle control, and on-road driving. You must take these tests in the type of vehicle for which you wish to be licensed.

**Pre-trip Vehicle Inspection.** You will be tested to see if you know whether your vehicle is safe to drive. You may be asked to do a pre-trip inspection of your vehicle and explain to the examiner what you would inspect and why. Section 10 of this manual tells you what to inspect and how to inspect it.

**Basic Vehicle Control.** You will be tested on your ability to control the vehicle. You will be asked to

move your vehicle forward, backward, and turn it within a defined area. These areas may be marked with traffic lanes, cones, barriers, or something similar. The examiner will tell you how each control test is to be done. Section 11 of this manual explains more about this test.

**On-Road Test.** You will be tested on your ability to safely drive your vehicle in a variety of traffic situations. The situations may include left and right turns, intersections, railway crossings, curves, up and down grades, single or multi-lane roads, streets, or highways. The examiner will tell you where to drive. Section 12 of this manual explains more about this test.

## 1.2 Other CDL Rules

There are other federal and state rules which affect drivers operating CMVs in all states.

- You cannot have more than one license. If you break this rule, a court may fine you up to \$5,000 or put you in jail. Keep your home state license and return any others.
- You must notify your employer within 30 days of conviction for any traffic violations (except parking). This is true no matter what type of vehicles you were driving.
- You must notify your motor vehicle licensing agency within 30 days if you are convicted in any other jurisdiction of any traffic violation (except parking). This is true no matter what type of vehicle you were driving.
- You must notify your employer if your license is suspended, revoked, or canceled, or if you are disqualified from driving.
- You must give your employer information on all driving jobs you have held for the past 10 years. You must do this when you apply for a commercial driving job.
- No one can drive a commercial motor vehicle without a CDL. A court may fine you up to \$5,000 or put you in jail for breaking this rule.
- Your employer may not let you drive a commercial motor vehicle if you have more than one license or if your CDL is suspended or revoked. A court may fine the employer up to \$5,000 or put him/her in jail for breaking this rule.
- All states are connected to one computerized system to share information about CDL drivers. The states will check on drivers' accident records and be sure that drivers don't get more than one CDL.
- You will lose your CDL for at least one year for a first offense:
  - If you drive a CMV under the influence of alcohol or a controlled substance (for example, illegal drugs).
  - If you leave the scene of an accident involving a CMV you were driving.
  - If you use a CMV to commit a felony.

If the offense occurs while you are operating a CMV that is placarded for hazardous materials, you will lose your CDL for at least 3 years. You will lose your CDL for life for a second offense. You will also lose your CDL for life if you use a CMV to commit a felony involving controlled substances.

## Serious Traffic Violations

- You will lose your CDL:
  - For at least 60 days if you have committed 2 serious traffic violations within a 3-year period involving a CMV.
  - For at least 120 days for 3 serious traffic violations within a 3-year period.

"Serious traffic violations" are excessive speeding (15 mph or more above the posted limit), reckless driving, improper or erratic lane changes, following a vehicle too closely, and traffic offenses committed in a CMV in connection with fatal traffic accidents.

## **Disqualifications**

- It is illegal to operate a CMV if your Blood Alcohol Concentration (BAC) is .04% or more. You will lose your CDL for one year for your first offense. You will lose it for life for your second offense. If your blood alcohol concentration is less than 0.04% but you have any detectable amount, you will be put out-of-service for 24 hours.

## **Implied Consent**

- If you operate a CMV, you shall be deemed to have given your consent to alcohol testing for the above mentioned violations.

These rules will improve highway safety for you and for all highway users.

Your state may have additional rules which you must also obey.

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[Next](#)



## Section 2: Driving Safely

This section contains knowledge and safe driving information that **all** commercial drivers should know. You must pass a test on this information to get a CDL.

This section does **NOT** have specific information on air brakes, combination vehicles, doubles, or passenger vehicles. You must read other sections of this manual to learn about them.

This section does have basic information on hazardous materials (HazMat) that all drivers should know. If you need a HazMat endorsement, you should study [Section 9](#).

### 2.1 Vehicle Inspection

Safety is the most important reason you inspect your Vehicle. Safety for yourself and for other road users.

#### Why inspect?

A vehicle defect found during an inspection could save you problems later. You could have a breakdown on the road that will cost time and dollars, or even worse, a crash caused by the defect.

Federal and state laws require that drivers inspect their vehicles. Federal and state inspectors also may inspect your vehicles. If they judge the vehicle to be unsafe, they will put it "out of service" until it is fixed.

#### Types of Vehicle Inspection

**Pre-trip Inspection.** A pre-trip inspection will help you find problems that could cause a crash or breakdown.

**During a Trip.** For safety you should:

- Watch gauges for signs of trouble.
- Use your senses to check for problems (look, listen, smell, feel).
- Check critical items when you stop:
  - Tires, wheels and rims.
  - Brakes.
  - Lights and reflectors.
  - Brake and electrical connections to trailer.
  - Trailer coupling devices.
  - Cargo securement devices.

**After-Trip Inspection and Report.** You should do an after-trip inspection at the end of the trip, day, or tour of duty on each vehicle you operated. It may include filling out a **vehicle condition report** listing any problems you find. The inspection report helps the motor carrier know when the vehicle needs repairs.

#### What to Look For



## **Tire Problems:**

- Too much or too little air pressure.
- Bad wear. You need at least 4/32 inch tread depth in every major groove on front tires, You need 2/32 inch on other tires. No fabric should show through the tread or sidewall.
- Cuts or other damage.
- Tread separation.
- Dual tires that come in contact with each other or parts of the vehicle.
- Mismatched sizes.
- Radial and bias-ply tires used together.
- Cut or cracked valve stems.
- Regrooved, recapped, or retreaded tires on the front wheels of a bus. These are prohibited.

## **Wheel and Rim Problems**

- Damaged rims.
- Rust around wheel nuts may mean the nuts are loose-check tightness. After a tire has been changed, stop a short while later and re-check tightness of nuts.
- Missing clamps, spacers, studs, or lugs means danger.
- Mismatched, bent, or cracked lock rings are dangerous.
- Wheels or rims that have had welding repairs are not safe.

## **Bad Brake Drums or Shoes**

- Cracked drums.
- Shoes or pads with oil, grease, or brake fluid on them.
- Shoes worn dangerously thin, missing, or broken.

## **Steering System Defects (See Figure 2-1)**

- Missing nuts, bolts, cotter keys, or other parts.
- Bent, loose, or broken parts, such as steering column, steering gear box, or tie rods.
- If power steering equipped-hoses, pumps, and fluid level; check for leaks.
- Steering wheel play of more than 10 degrees (approximately 2 inches movement at the rim of a 20-inch steering wheel) can make it hard to steer.

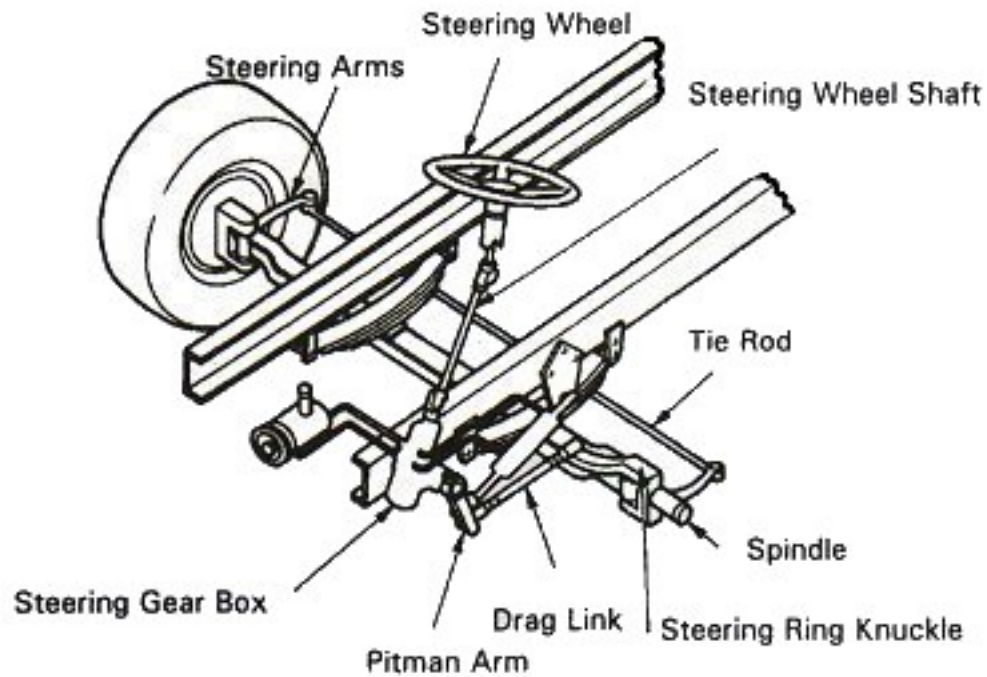


Figure 2-1

### Examples of Steering System Key Parts

**Suspension System Defects.** The suspension system holds up the vehicle and its load. It keeps the axles in place. Therefore, broken suspension parts can be extremely dangerous. Look for:

- Spring hangers (Figure 2-2) that allow movement of axle from proper position.
- Cracked or broken spring hangers.
- Missing or broken leaves in any leaf spring. If one fourth or more are missing, it will put the vehicle "out of service" but any defect could be dangerous (Figure 2-3).
- Broken leaves in a multi-leaf spring or leaves that have shifted so they might hit a tire or other part.
- Leaking shock absorbers (Figure 2-4).
- Torque rod or arm, U-bolts, spring hangers, or other axle positioning parts that are cracked, damaged, or missing (Figure 2-2).
- Air suspension systems that are damaged and/or leaking (Figure 2-4).
- Any loose, cracked, broken, or missing frame members.

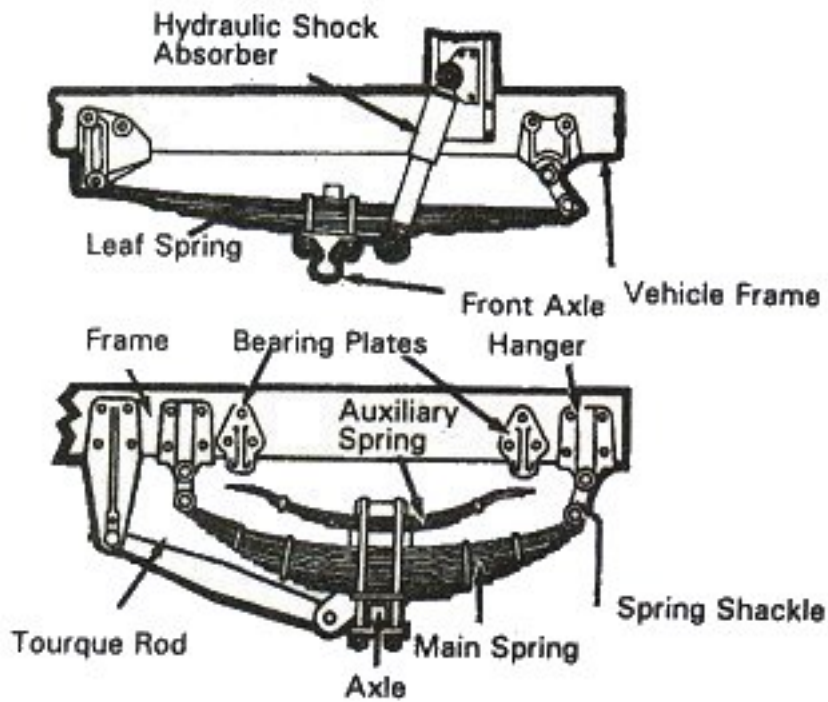


Figure 2-2 Key Suspension Parts

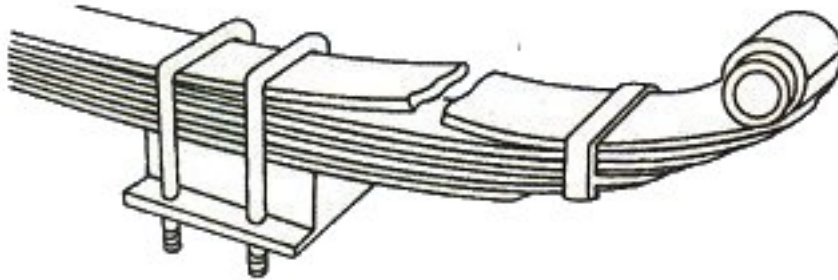


Figure 2-3

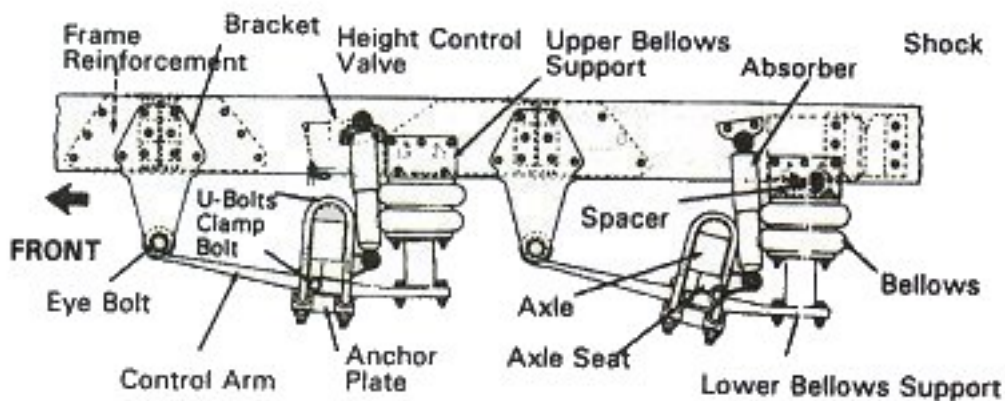


Figure 2-4 Air Suspension Parts

**Exhaust System Defects.** A broken exhaust system can let poison fumes into the cab or sleeper berth. Look for:

- Loose, broken, or missing exhaust pipes, mufflers, tailpipes, or vertical stacks.
- Loose, broken, or missing mounting brackets, clamps, bolts, or nuts.
- Exhaust system parts rubbing against fuel system parts, tires, or other moving parts of vehicle.
- Exhaust system parts that are leaking.

**Emergency Equipment.** Vehicles must be equipped with emergency equipment. Look for:

- Fire extinguisher(s).
- Spare electrical fuses (unless equipped with circuit breakers).
- Warning devices for parked vehicles (for example, three reflective warning triangles).

**Cargo (Trucks).** You must make sure the truck is not overloaded and the cargo is balanced and secured before each trip. If the cargo contains hazardous materials, you must inspect for proper papers and placarding.

## CDL Pre-trip Vehicle Inspection Test

In order to obtain a CDL you will be required to pass a pre-trip vehicle inspection test. You will be tested to see if you know whether your vehicle is safe to drive. You may be asked to do a pre-trip inspection of your vehicle and explain to the examiner what you would inspect and why. Section 10 of this manual tells you what to inspect and how to inspect it. Some states allow the guides shown in Figures 2-5, 2-6, and 2-7 to be used as a memory aid when taking your test.

## A Seven-Step Inspection

**Method of inspection.** You should do a pre-trip inspection the same way each time so you will learn all the steps and be less likely to forget something. The following seven-step method should be useful. Guides are shown in Figures 2-5, 2-6, and 2-7.

**Approaching the vehicle.** Notice general condition. Look for damage or vehicle leaning to one side. Look under the vehicle for fresh oil, coolant, grease, or fuel leaks. Check the area around the vehicle for hazards to vehicle movement (people, other vehicles, objects, low hanging wires, limbs, etc.)

## Test Your Knowledge

1. What is the most important reason for doing a vehicle inspection?
2. What things should you check during a trip?
3. Name some key steering system parts.
4. Name some suspension system defects.
5. What three kinds of emergency equipment must you have?
6. What is the minimum tread depth for front tires?
7. For other tires?

*These questions may be on the test. If you can't answer them all, re-read [2.1 Vehicle Inspection](#).*

## 1: Vehicle Overview

**Review last vehicle inspection report.** Drivers may have to make a vehicle inspection report in writing each day. The motor carrier must repair any items in the report that affects safety and certify on the

report that repairs were made or were unnecessary. You must sign the report only if defects were noted and certified to be repaired or not needed to be repaired.

Vehicle Inspection Guide  
(Key Locations To Inspect)

FRONT

Headlights, Signal &  
Clearance Lights  
Windshield Wipers

Front suspension  
Front Wheel

Front Brake  
Cab/Driver Area

Fuel Tank Area

Rear Wheels  
Rear Suspension



Signal, Brake & Clearance Lights

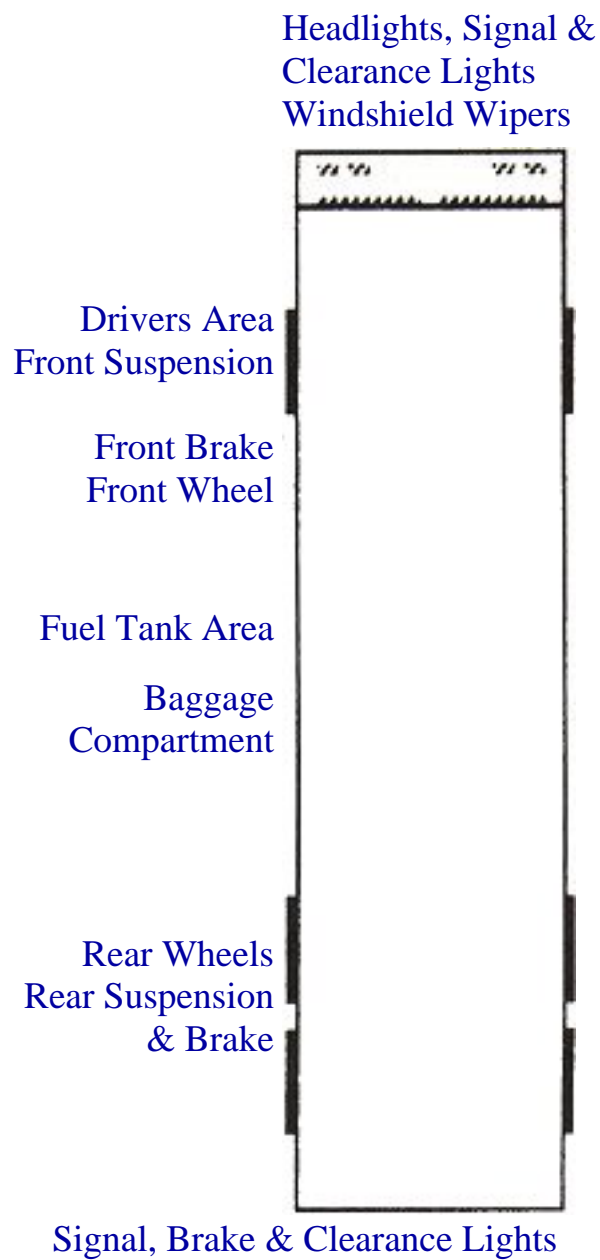
REAR

Fig 2-5  
Straight Truck  
School Bus

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Vehicle Inspection Guide  
(Key Locations To Inspect)

FRONT



REAR

Fig 2-6

Coach

Transit Bus

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Vehicle Inspection Guide  
(Key Locations To Inspect)

FRONT

Headlights, Signal &  
Clearance Lights  
Windshield Wipers

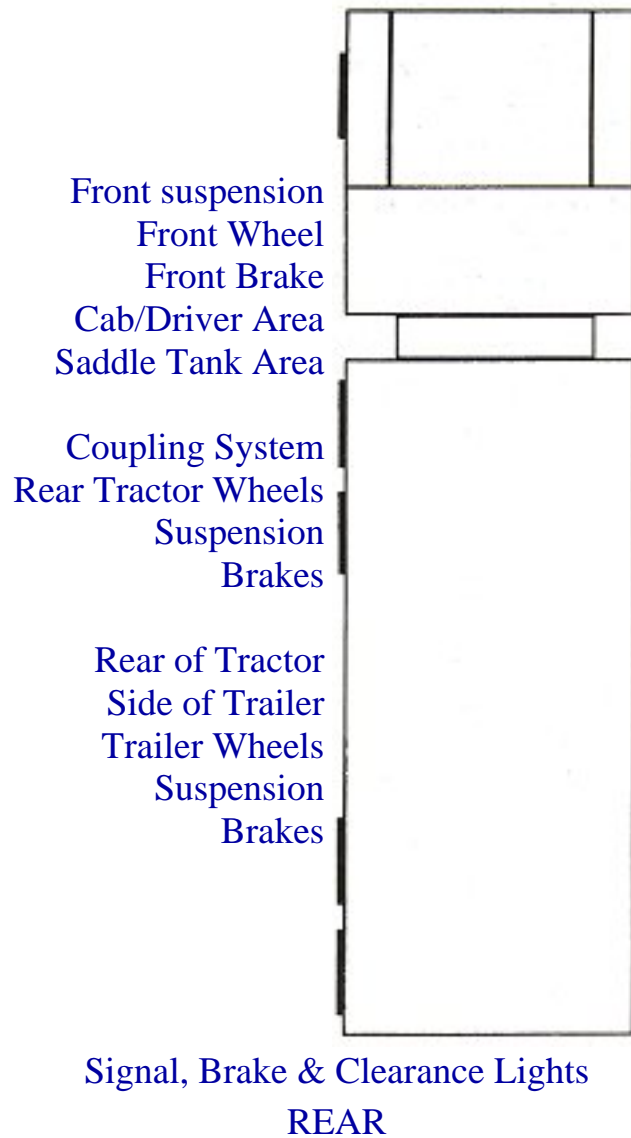


Fig 2-7  
Tractor Trailer

**Safety Note:** If you are parked on a street, walk around so you are facing the oncoming traffic. Pay attention so you don't get run over.

## ***2: Check Engine Compartment***

Check that the parking brakes are on and/or wheels chocked. You may have to raise the hood, tilt the cab (secure loose things so they don't fall and break something), or open the engine compartment door.

Check the following:

- Engine oil level.
- Coolant level in radiator; condition of hoses.
- Power steering fluid level; hose condition (if so equipped).
- Windshield washer fluid level.
- Battery fluid level, connections and tie downs (battery may be located elsewhere).
- Automatic transmission fluid level (may require engine to be running).



- Check belts for tightness and excessive wear (alternator, water pump, air compressor)-learn how much "give" the belts should have when adjusted right, and check each one.
- Leaks in the engine compartment (fuel, coolant, oil, power steering fluid, hydraulic fluid, battery fluid).
- Cracked, worn electrical wiring insulation.

Lower and secure hood, cab, or engine compartment door.

### ***3: Start Engine and Inspect***

#### **Get in and Start Engine**

- Make sure parking brake is on.
- Put gearshift in neutral (or "park" if automatic).
- Start engine; listen for unusual noises.

#### **Look at the Gauges**

- **Oil pressure.** Should come up to normal within seconds after engine is started.
- **Ammeter** and/or **voltmeter.** Should be in normal range(s).
- **Coolant temperature.** Should begin gradual rise to normal operating range.
- **Engine oil temperature.** Should begin gradual rise to normal operating range.
- **Warning lights and buzzers.** Oil, coolant, charging circuit warning lights should go out right away.

**Check Condition of Controls.** Check all of the following for looseness, sticking, damage, or improper setting:

- Steering wheel.
- Clutch.
- Accelerator ("gas pedal").
- Brake controls.
  - Foot brake.
  - Trailer brake (if vehicle has one).
  - Parking brake.
  - Retarder controls (if vehicle has them).
- Transmission controls.
- Interaxle differential lock (if vehicle has one).
- Horn(s).
- Windshield wiper/washer.
- Lights.
  - Headlights.
  - Dimmer switch.
  - Turn signal.

--4-way flashers.

--Clearance, identification, marker light switch(es).

**Check Mirrors and Windshield.** Inspect mirrors and windshield for cracks, dirt, illegal stickers, or other obstructions to seeing. Clean and adjust as necessary.

### **Check Emergency Equipment**

- Check for safety equipment:
  - Spare electrical fuses (unless vehicle has circuit breakers).
  - Three red reflective triangles.
  - Properly charged and rated fire extinguisher.
- Check for optional items such as:
  - Tire chains (where winter conditions require them).
  - Tire changing equipment.
  - List of emergency phone numbers.
  - Accident reporting kit (packet).

### ***4: Turn Off Engine and Check Lights***

Make sure the parking brake is set, turn off the engine, and take the key with you. Turn on headlights (low beams) and four-way flashers, and get out.

### ***5: Do Walk-around Inspection***

- Go to front of vehicle and check that low beams are on and both of the four-way flashers are working.
- Push dimmer switch and check that high beams work.
- Turn off headlights and four-way, hazard warning flashers.
- Turn on parking, clearance, side-marker and identification lights.
- Turn on right turn signal, and start walk-around inspection.

### **General**

- Walk around and inspect.
- Clean all lights, reflectors and glass as you go along.

### **Left Front Side**

- Driver's door glass should be clean.
- Door latches or locks work properly.
- Left front wheel.
  - Condition of wheel and rim -- missing, bent, broken studs, clamps, lugs, any signs of misalignment.
  - Condition of tires--properly inflated, valve stem and cap OK, no serious cuts, bulges, tread wear.

- Use wrench to test rust-streaked lug nuts, indicating looseness.
- Hub oil level OK, no leaks.
- Left front suspension.
  - Condition of spring, spring hangers, shackles, u-bolts.
  - Shock absorber condition.
- Left front brake.
  - Condition of brake drum.
  - Condition of hoses.

## Front

- Condition of front axle.
- Condition of steering system.
  - No loose, worn, bent, damaged or missing parts.
  - Must grab steering mechanism to test for looseness.
- Condition of windshield.
  - Check for damage and clean if dirty.
  - Check windshield wiper arms for proper spring tension.
  - Check wiper blades for damage, "stiff" rubber, and securement.
- Lights and reflectors.
  - Parking, clearance, and identification lights clean, operating, and proper color (amber at front).
  - Reflectors clean and proper color (amber at front).
- Right front turn signal light clean, operating, and proper color (amber or white on signals facing forward).

## Right Side

- Right front: check all items as done on left front.
- Primary and secondary safety cab locks engaged (if cab-over-engine design).
- Right fuel tank(s).
  - Securely mounted, not damaged or leaking.
  - Fuel crossover line secure.
  - Tank(s) contain enough fuel.
  - Cap(s) on and secure.
- Condition of visible parts.
  - Rear of engine--not leaking.
  - Transmission--not leaking.
  - Exhaust system--secure, not leaking, not touching wires, fuel, or air lines.
  - Frame and cross members--no bends, cracks.

- Air lines and electrical wiring--secured against snagging, rubbing, wearing.
- Spare tire carrier or rack not damaged (if so equipped).
- Spare tire and/or wheel securely mounted in rack.
- Spare tire and wheel adequate (proper size, properly inflated).
- Cargo securement (trucks).
  - Cargo properly blocked, braced, tied, chained, etc.
  - Header board adequate, secure (if required).
  - Side boards, stakes strong enough, free of damage, properly set in place (if so equipped).
  - Canvas or tarp (if required) properly secured to prevent tearing, billowing, or blocking of mirrors.
  - If oversize, all required signs (flags, lamps, and reflectors) must be safely and properly mounted and all required permits in driver's possession.
  - Curbside cargo compartment doors securely closed, latched/locked, required security seals in place.

## **Right Rear**

- Condition of wheels and rims--no missing, bent, broken spacers, studs, clamps, lugs.
- Condition of tires--properly inflated, valve stems and caps OK, no serious cuts, bulges, tread wear, tires not rubbing each other and nothing stuck between them.
- Tires same type, e.g., not mixed radial and bias types.
- Tires evenly matched (same sizes).
- Wheel bearing/seals not leaking.
- Suspension.
  - Condition of spring(s), spring hangers, shackles, and U-bolts.
  - Axle secure.
  - Powered axle(s) not leaking lube (gear oil).
  - Condition of torque rod arms, bushings.
  - Condition of shock absorber(s).
  - If retractable axle equipped, check condition of lift mechanism. If air powered, check for leaks.
- Brakes.
  - Brake adjustment.
  - Condition of brake drum(s).
  - Condition of hoses--look for any wear due to rubbing.
- Lights and reflectors.
  - Side-marker lights clean, operating, and proper color (red at rear, others amber).
  - Side-marker reflectors clean and proper color (red at rear, others amber).

## **Rear**

- Lights and reflectors.
  - Rear clearance and identification lights clean, operating, and proper color (red at rear).
  - Reflectors clean and proper color (red at rear).
  - Taillights clean, operating, and proper color (red at rear).
  - Right rear turn signal operating, and proper color (red, yellow, or amber at rear).
- License plate(s) present, clean, and secured.
- Splash guards present, not damaged, properly fastened, not dragging on ground or rubbing tires.
- Cargo secure (trucks).
  - Cargo properly blocked, braced, tied, chained, etc.
  - Tailboards up and properly secured.
  - End gates free of damage, properly secured in stake sockets.
  - Canvas or tarp (if required) properly secured to prevent tearing or billowing to block either the rearview mirrors or to cover rear lights.
  - If over-length, or over-width, make sure all signs and/or additional lights/flags are safely and properly mounted and all required permits are in driver's possession.
  - Rear doors securely closed, latched/locked.

## **Left Side**

- Check all items as done on right side, plus:
  - Battery(s) (if not mounted in engine compartment).
  - Battery(s) box securely mounted to vehicle.
  - Box has secure cover.
  - Battery(s) secured against movement.
  - Battery(s) not broken or leaking
  - Fluid in battery(s) at proper level (except maintenance-free type).
  - Cell caps present and securely tightened (except maintenance-free type).
  - Vents in cell caps free of foreign material (except maintenance-free type).

## **6: Check Signal Lights**

### **Get In and Turn Off Lights.**

- Turn off all lights.
- Turn on stop lights (apply trailer hand brake or have a helper put on the brake pedal).
- Turn on left turn signal lights.

### **Get Out and Check Lights.**

- Left front turn signal light clean, operating and proper color (amber or white on signals facing the front).
- Left rear turn signal light and both stop lights clean, operating, and proper color (red, yellow, or amber).

## **Get In Vehicle.**

- Turn off lights not needed for driving.
- Check for all required papers, trip manifests, permits, etc.
- Secure all loose articles in cab (they might interfere with operation of the controls or hit you in a crash).
- Start the engine.

## ***7: Start the Engine and Check Brake System***

**Test For Hydraulic Leaks.** If the vehicle has hydraulic brakes, pump the brake pedal three times. Then apply firm pressure to the pedal and hold for five seconds. The pedal should not move. If it does, there may be a leak or other problem. Get it fixed before driving.

**If the vehicle has air brakes, do the checks described in Sections 5 and 6 of this manual.**

## **Test Parking Brake**

- Fasten seat belt.
- Allow vehicle to move forward slowly.
- Apply parking brake.
- If it doesn't stop vehicle, it is faulty; get it fixed.

## **Test Service Brake Stopping Action**

- Go about five miles per hour.
- Push brake pedal firmly.
- "Pulling" to one side or the other can mean brake trouble.
- Any unusual brake pedal "feel" or delayed stopping action can mean trouble.

This completes the pretrip inspection.

**If you find anything unsafe during the pre-trip inspection, get it fixed.  
Federal and state laws forbid operating an unsafe vehicle.**

## **Inspection During a Trip      Check Vehicle Operation Regularly**

### **You should check:**

- Instruments.
- Air pressure gauge (if you have air brakes).
- Temperature gauges.
- Pressure gauges.
- Ammeter/voltmeter.
- Mirrors.
- Tires.
- Cargo, cargo covers.

If you see, hear, smell, or feel anything that might mean trouble, check it out.

## **Safety Inspection**

- Drivers of trucks and truck tractors when transporting cargo must inspect the securement of the cargo within the first 25 miles of a trip and every 150 miles or every 3 hours (whichever comes first) afterward.

## **After-trip Inspection & Report**

You may have to make a written report each day on the condition of the vehicle(s) you drove. Report anything affecting safety or possibly leading to mechanical breakdown.

The vehicle inspection report tells the motor carrier about problems that may need fixing. Keep a copy of your report in the vehicle for one day. That way, the next driver can learn about any problems you have found.

## **Test Your Knowledge**

1. Name some things you should check on the front of your vehicle during the walk-around inspection.
2. What should wheel bearing seals be checked for?
3. How many red reflective triangles should you carry?
4. How do you test hydraulic brakes for leaks?
5. Can you bring the "vehicle inspection memory aide" with you to the test?
6. Why put the starter switch key in your pocket during the pre-trip inspection?

*These questions may be on the test. If you can't answer them all, re-read about the [seven-step](#) inspection method.*

## **2.2 Basic Control of Your Vehicle**

To drive a vehicle safely, you must be able to control its speed and direction. Safe operation of a commercial vehicle requires skill in:

- Accelerating.
- Steering.
- Shifting gears.
- Braking.

Fasten your seatbelt when on the road. Apply the parking brake when you leave your vehicle.

### **Accelerating**

Don't roll back when you start. You may hit someone behind you. Partly engage the clutch before you take your right foot off the brake. Put on the parking brake whenever necessary to keep from rolling back. Release the parking brake only when you have applied enough engine power to keep from rolling back. On a tractor-trailer equipped with a trailer brake hand valve, the hand valve can be applied to keep



from rolling back.

Speed up smoothly and gradually so the vehicle does not jerk. Rough acceleration can cause mechanical damage. When pulling a trailer, rough acceleration can damage the coupling.

Speed up very gradually when traction is poor, as in rain or snow. If you use too much power, the drive wheels may spin. You could lose control. If the drive wheels begin to spin, take your foot off the accelerator.

## Steering

**Hold the Wheel Properly.** Hold the steering wheel firmly with both hands. Your hands should be on opposite sides of the wheel. If you hit a curb or a pothole (chuckhole), the wheel could pull away from your hands unless you have a firm hold.

## Backing Safely

Because you cannot see everything behind your vehicle, **backing is always dangerous**. Avoid backing whenever you can. When you park, try to park so you will be able to pull forward when you leave. When you have to back, here are a few simple safety rules:

- Look at your path.
- Back slowly.
- Back and turn toward the driver's side whenever possible.
- Use a helper whenever possible.

These rules are discussed in turn below.

**Look at Your Path.** Look at your line of travel **before** you begin. Get out and walk around the vehicle. Check your clearance to the sides and overhead in and near the path your vehicle will take.

**Back Slowly.** Always back as slowly as possible. Use the lowest reverse gear. That way you can more easily correct any steering errors. You also can stop quickly if necessary.

**Back and Turn Toward the Driver's Side.** Back to the driver's side so you can see better. Backing toward the right side is very dangerous because you can't see as well. If you back and turn toward the driver's side, you can watch the rear of your vehicle by looking out the side window. Use driver-side backing -- even if it means going around the block to put your vehicle in this position. The added safety is worth it.

**Use a Helper.** Use a helper when you can. There are blind spots you can't see. That's why a helper is important.

The helper should stand near the back of your vehicle where you can see the helper. Before you begin backing, work out a set of hand signals that you both understand. Agree on a signal for "stop."

## Backing with a Trailer

**Backing with a Trailer.** When backing a car, straight truck, or bus, you turn the top of the steering wheel toward the direction you want to go. When backing a trailer, you turn the steering wheel in the opposite direction. Once the trailer starts to turn, you must turn the wheel the other way to follow the

trailer.

Whenever you back with a trailer, try to position your vehicle so you can back in a straight line. If you must back on a curved path, back to the driver's side so you can see.

**Back slowly.** This will let you make corrections before you get too far off course.

**Use the mirrors.** The mirrors will help you see whether the trailer is drifting to one side or the other.

**Correct drift immediately.** As soon as you see the trailer getting off the proper path, correct it by turning the top of the steering wheel in the direction of the drift.

**Pull forward.** When backing a trailer, make pull-ups to re-position your vehicle as needed.

### Test Your Knowledge

1. Why should you back toward the driver's side?
2. What is a pull-up?
3. If stopped on a hill, how can you start moving without rolling back?
4. When backing, why is it important to use a helper?
5. What's the most important hand signal that you and the helper should agree on?

*These questions may be on the test. If you can't answer them all, re-read [2.2 Basic Control of Your Vehicle](#).*

## 2.3 Shifting Gears

Correct shifting of gears is important. If you can't get your vehicle into the right gear while driving, you will have less control.

### Manual Transmissions

**Basic Method for Shifting Up.** Most heavy vehicles with manual transmissions require double clutching to change gears. This is the basic method:

- Release accelerator, push in clutch and shift to neutral at the same time.
- Release clutch.
- Let engine and gears **slow down** to the RPM required for the next gear (this takes practice).
- Push in clutch and shift to the higher gear at the same time.
- Release clutch and press accelerator at the same time.

Shifting gears using double clutching requires practice. If you remain too long in neutral, you may have difficulty putting the vehicle into the next gear. If so, don't try to force it. Return to neutral, release clutch, increase engine speed to match road speed, and try again.

**Knowing When to Shift Up.** There are two ways of knowing when to shift:

**Use engine speed (RPM).** Study the driver's manual for your vehicle and learn the operating RPM range. Watch your tachometer, and shift up when your engine reaches the top of the range. (Some newer

vehicles use "progressive" shifting: the RPM at which you shift becomes higher as you move up in the gears. Find out what's right for the vehicle you will operate.)

**Use road speed (mph).** Learn what speeds each gear is good for. Then, by using the speedometer, you'll know when to shift up.

With either method, you may learn to use engine sounds to know when to shift.

### **Basic Procedures for Shifting Down**

1. Release accelerator, push in clutch, and shift to neutral at the same time.
2. Release clutch.
3. Press accelerator, increase engine and gear speed to the RPM required in the lower gear.
4. Push in clutch and shift to lower gear at the same time.
5. Release clutch and press accelerator at the same time.

Downshifting, like upshifting, requires knowing when to shift. Use either the tachometer or the speedometer and downshift at the right RPM or road speed.

Special conditions where you should downshift are:

**Before starting down a hill.** Slow down and shift down to a speed that you can control without using the brakes hard. Otherwise the brakes can overheat and lose their braking power. Downshift **before** starting down the hill. Make sure you are in a low enough gear, usually lower than the gear required to climb the same hill.

**Before entering a curve.** Slow down to a safe speed, and downshift to the right gear before entering the curve. This lets you use some power through the curve to help the vehicle be more stable while turning. It also lets you speed up as soon as you are out of the curve.

### **Multi-Speed Rear and Axles Auxiliary Transmission**

Multi-speed rear axles and auxiliary transmissions are used on many vehicles to provide extra gears. You usually control them by a selector knob or switch on the gearshift lever of the main transmission. There are many different shift patterns. Learn the right way to shift gears in the vehicle you will drive.

### **Automatic Transmissions**

Some vehicles have automatic transmissions. You can select a low range to get greater engine braking when going down grades. The lower ranges prevent the transmission from shifting up beyond the selected gear (unless the governor RPM is exceeded). It is very important to use this braking effect when going down grades.

### **Retarders**

Some vehicles have "retarders." Retarders help slow a vehicle, reducing the need for using your brakes. They reduce brake wear and give you another way to slow down. There are many types of retarders (exhaust, engine, hydraulic, electric). All retarders can be turned on or off by the driver. On some the retarding power can be adjusted. When turned "on," retarders apply their braking power (to the drive wheels only) whenever you let up on the accelerator pedal all the way.

**Caution.** When your drive wheels have poor traction, the retarder may cause them to skid. Therefore, you should turn the retarder off whenever the road is wet, icy, or snow covered.

## Test Your Knowledge

1. What are the two special conditions where you should downshift?
2. When should you downshift automatic transmissions?
3. Retarders keep you from skidding when the road is slippery. True or False?
4. What are the two ways to know when to shift?

*These questions may be on the test. If you can't answer them all, re-read [Section 2.3: Shifting Gears](#).*

## 2.4 Seeing

To be a safe driver you need to know what's going on all around your vehicle. Not looking properly is a major cause of accidents.

### Seeing Ahead

All drivers look ahead; but many don't look **far enough** ahead.

**Importance of looking far enough ahead.** Because stopping or changing lanes can take a lot of distance, knowing what the traffic is doing on all sides of you is very important. You need to look well ahead to make sure you have room to make these moves safely.

**How Far Ahead to Look.** Most good drivers look 12 to 15 seconds ahead. That means looking ahead the distance you will travel in 12 to 15 seconds. At lower speeds, that's about one block. At highway speeds it's about a quarter of a mile. If you're not looking that far ahead, you may have to stop too quickly or make quick lane changes. Looking 12 to 15 seconds ahead doesn't mean not paying attention to things that are closer. Good drivers shift their attention back and forth, near and far.

**Look for Traffic.** Look for vehicles coming onto the highway, into your lane, or turning. Watch for brakelights from slowing vehicles. By seeing these things far enough ahead, you can change your speed or change lanes if necessary to avoid a problem.

**Look for Road Conditions.** Look for hills and curves--anything you'll have to slow or change lanes for. Pay attention to traffic signals and signs. If a light has been green for a long time, it will probably change before you get there. Start slowing down and be ready to stop. Traffic signs may alert you to road conditions where you may have to change speed.

**Seeing to the Sides and Rear.** It's important to know what's going on behind and to the sides. Check your mirrors regularly. Check more often in special situations.

**Mirror Adjustment.** Mirror adjustment should be checked prior to the start of any trip and can only be checked accurately when the trailer(s) are straight. You should check and adjust each mirror as needed.

**Regular Checks.** You need to make regular checks of your mirrors to be aware of traffic and to check your vehicle.

**Traffic.** Check your mirrors for vehicles on either side and in back of you. In an emergency, you may

need to know whether you can make a quick lane change. Use your mirrors to spot overtaking vehicles. There are "blind spots" that your mirrors cannot show you. Check your mirrors regularly to know where other vehicles are around you, and to see if they move into your blind spots.

**Check your vehicle.** Use the mirrors to keep an eye on your tires. It's one way to spot a tire fire. If you're carrying open cargo, you can use the mirrors to check it. Look for loose straps, ropes, or chains. Watch for a flapping or ballooning tarp.

**Special Situations.** Special situations require more than regular mirror checks. These are lane changes, turns, merges, and tight maneuvers.

**Lane changes.** You need to check your mirror to make sure no one is alongside you or about to pass you. Check your mirrors:

- Before you change lanes to make sure there is enough room.
- After you have signaled to check that no one has moved into your blind spot.
- Right after you start the lane change to double-check that your path is clear.
- After you complete the lane change.

**Turns.** In turns, check your mirrors to make sure the rear of your vehicle will not hit anything.

**Merges.** When merging, use your mirrors to make sure the gap in traffic is large enough for you to enter safely.

**Tight maneuvers.** Any time you are driving in close quarters check your mirrors often. Make sure you have enough clearance.

**How to Use Mirrors.** Use mirrors correctly by checking them quickly and understanding what you see.

**Checking quickly.** When you use your mirrors while driving on the road, check quickly. Look back and forth between the mirrors and the road ahead. Don't focus on the mirrors for too long. Otherwise, you will travel quite a distance without knowing what's happening ahead.

**Understanding what you see.** Many large vehicles have curved (convex, "fisheye," "spot," "bugeye") mirrors that show a wider area than flat mirrors. This is often helpful. But everything appears smaller in a convex mirror than it would if you were looking at it directly. Things also seem farther away than they really are. It's important to realize this and to allow for it.

## 2.5 Communicating

Other drivers can't know what you are going to do until you tell them.

### Signal Your Intentions

Signaling what you intend to do is important for safety. Here are some general rules for signaling.

**Turns.** There are three good rules for using turn signals.

1. Signal early. Signal well before you turn. It is the best way to keep others from trying to pass you.
2. Signal continuously. You need both hands on the wheel to turn safely. Don't cancel the signal until you have completed the turn.



3. **Cancel your signal.** Don't forget to turn off your turn signal after you've turned (if you don't have self-canceling signals).

**Lane Changes.** Put your turn signal on before changing lanes. Change lanes slowly and smoothly. That way a driver you didn't see may have a chance to honk his/her horn or avoid your vehicle.

**Slowing Down.** Warn drivers behind you when you see you'll need to slow down. A few light taps on the brake pedal -- enough to flash the brake lights -- should warn following drivers. Use the 4- way emergency flashers for times when you are driving very slow or are stopped. Warn other drivers in any of the following situations:

**Trouble ahead.** The size of your vehicle may make it hard for drivers behind you to see hazards ahead. If you see a hazard that will require slowing down, warn the drivers behind by flashing your brake lights.

**Tight turns.** Most car drivers don't know how slow you have to go to make a tight turn in a large vehicle. Give drivers behind you warning by braking early and slowing gradually.

**Stopping on the road.** Truck and bus drivers sometimes stop in the road to unload cargo or passengers or to stop at a railroad crossing. Warn following drivers by flashing your brake lights. Don't stop suddenly.

**Driving Slowly.** Drivers often do not realize how fast they are catching up to a slow vehicle until they are very close. If you must drive slowly, alert following drivers by turning on your emergency flashers if it is legal. (Laws regarding the use of flashers differ from one state to another. Check the laws of the states where you will drive.)

**Don't Direct Traffic.** Some drivers try to help out others by signaling when it is safe to pass. You should not do this. You could cause an accident. You could be blamed and it could cost you many thousands of dollars.

## **Communicating Your Presence**

Other drivers may not notice your vehicle even when it's in plain sight. Let them know you're there to help prevent accidents.

**When Passing.** Whenever you are about to pass a vehicle, pedestrian, or bicyclist, assume they don't see you. They could suddenly move in front of you. When it is legal, tap the horn lightly or, at night, flash your lights from low to high beam and back. And drive carefully enough to avoid a crash even if they don't see or hear you.

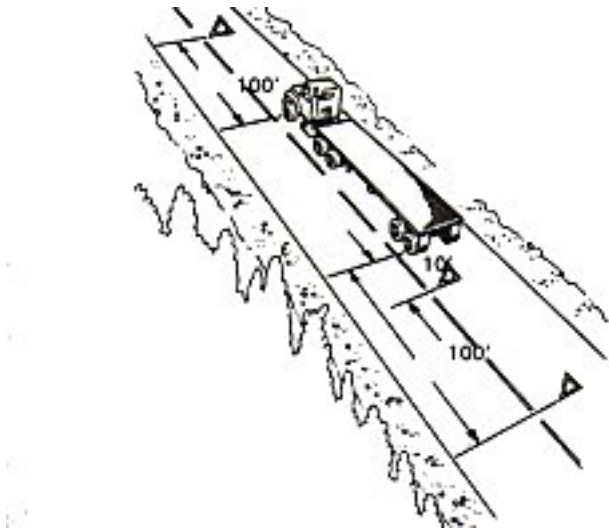
**When It's Hard to See.** At dawn or dusk or in rain or snow, you need to make yourself easier to see. If you are having trouble seeing other vehicles, other drivers will have trouble seeing you. Turn on your lights. Use the headlights, not just the identification or clearance lights. Use the low beams; high beams can bother people in the daytime as at night.

**When Parked At the Side of the Road.** When you pull off the road and stop, be sure to turn on the 4-way emergency flashers. This is important at night. Don't trust the taillights to give warning. Drivers have crashed into the rear of a parked vehicle because they thought it was moving normally.

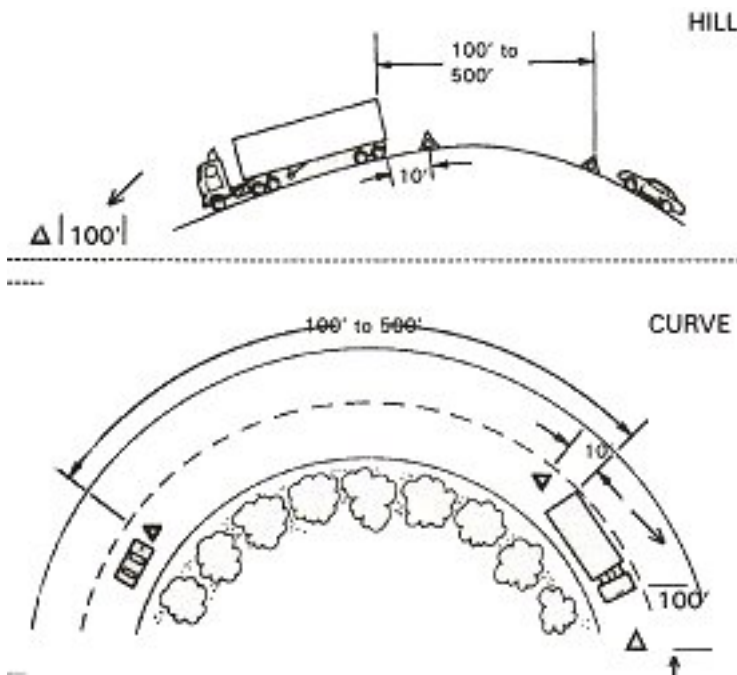
If you must stop on a road or the shoulder of any road, you must put out your emergency warning

devices within ten minutes. Place your warning devices at the following locations:

- If you stop on a 2-lane road carrying traffic in both directions or on an undivided highway, place warning devices within ten feet of the front or rear corners to mark the location of the vehicle and 100 feet behind and ahead of the vehicle, on the shoulder or in the lane you stopped in.



- Back beyond any hill, curve, or other obstruction that prevents other drivers from seeing the vehicle within 500 feet.



- If you must stop on or by a one-way or divided highway, place warning devices 10 feet, 100 feet, and 200 feet toward the approaching traffic.

When putting out the triangles, hold them between yourself and the oncoming traffic for your own safety. (So other drivers can see you.)

**Use Your Horn When Needed.** Your horn can let others know you're there. It can help to avoid a crash. Use your horn when needed. However, it can startle others and could be dangerous when used unnecessarily.





# Section 3: Transporting Cargo Safely

This section tells you about hauling cargo safely. You must understand basic cargo safety rules to get a CDL.

If you load cargo wrong or do not secure it, it can be a danger to others and yourself. Loose cargo that falls off a vehicle can cause traffic problems and others could be hurt or killed. Loose cargo could hurt or kill you during a quick stop or crash. Your vehicle could be damaged by an overload. Steering could be affected by how a vehicle is loaded, making it more difficult to control the vehicle.

Whether or not you load and secure the cargo yourself, you are responsible for:

- Inspecting your cargo.
- Recognizing overloads and poorly balanced weight.
- Knowing your cargo is properly secured.

These are discussed below.

If you intend to carry hazardous material that requires placards on your vehicle, you will also have to have a hazardous materials endorsement. Section 9 of this manual has the information you need to pass the hazardous materials test.

## 3.1 Inspecting Cargo

As part of your pre-trip inspection, make sure the truck is not overloaded and the cargo is balanced and secured properly.

### Before Starting

Inspect the cargo and its securing devices again within 25 miles after beginning a trip. Make any adjustments needed. Check the cargo and securing devices as often as necessary during a trip to keep the load secure. A good habit is to inspect again:

#### Every 3 hrs/150 Miles

- After you have driven for 3 hours or 150 miles.

#### After Every Break

- After every break you take during driving.

Federal, state, and local regulations for commercial vehicle weight, securing cargo, covering loads, and where you can drive large vehicles vary from place to place. Know the rules where you will be driving.

## 3.2 Weight & Balance

You are responsible for not being overloaded. Here are some definitions of weight you should know:

### Definitions You Should Know

**Gross vehicle weight (GVW).** The total weight of a single vehicle plus its load.

**Gross combination weight (GCW).** The total weight of a powered unit plus trailer(s) plus the cargo.

**Gross vehicle weight rating (GVWR).** The maximum GVW specified by the manufacturer for a single vehicle plus its load.

**Gross combination weight rating (GCWR).** The maximum GCW specified by the manufacturer for a specific combination of vehicles plus its load.

**Axle weight.** The weight transmitted to the ground by one axle or one set of axles.

**Tire load.** The maximum safe weight a tire can carry at a specified pressure. This rating is stated on the side of each tire.

**Suspension systems.** Suspension systems have a manufacturer's weight capacity rating.

**Coupling device capacity.** Coupling devices are rated for the maximum weight they can pull and/or carry.

## **Legal Weight Limits**

You must keep weights within legal limits. States have maximums for GVWs, GCWs and axle weights. Often, maximum axle weights are set by a bridge formula. A bridge formula permits less maximum axle weight for axles that are closer together. This is to prevent overloading bridges and roadways.

Overloading can have bad effects on steering, braking, and speed control. Overloaded trucks have to go very slow on upgrades. Worse, they may gain too much speed on downgrades. Stopping distance increases. Brakes can fail when forced to work too hard.

During bad weather or in mountains, it may not be safe to operate at legal maximum weights. Take this into account before driving.

## **Don't Be Top-Heavy**

The height of the vehicle's center of gravity is very important for safe handling. A high center of gravity (cargo piled up high or heavy cargo on top) means you are more likely to tip over. It is most dangerous in curves or if you have to swerve to avoid a hazard. It is very important to distribute the cargo so it is as low as possible. Put the heaviest parts of the cargo under the lightest parts.

## **Balance the Weight**

Poor weight balance can make vehicle handling unsafe. Too much weight on the steering axle can cause hard steering. It can damage the steering axle and tires. Underloaded front axles (caused by shifting weight too far to the rear) can make the steering axle weight too light to steer safely. Too little weight on the driving axles can cause poor traction. The drive wheels may spin easily.

During bad weather, the truck may not be able to keep going. Weight that is loaded so there is a high center of gravity causes greater chance of rollover. On flat bed vehicles, there is also a greater chance that the load will shift to the side or fall off. Figure 3-1 shows examples of the right and wrong way to balance cargo weight.

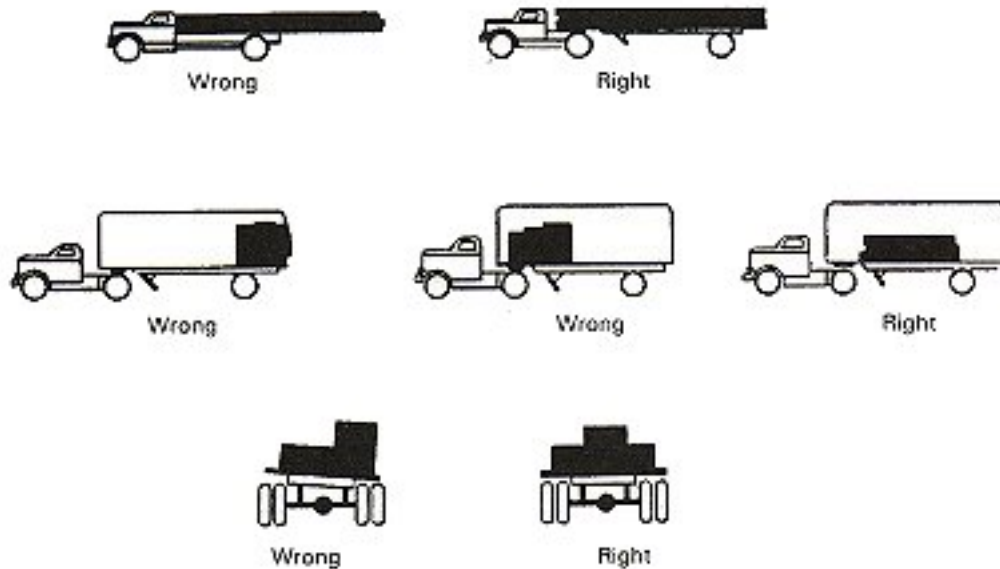


Figure 3-1

**Always load cargo the right way!**

### Test Your Knowledge

1. For what three things related to cargo are drivers responsible?
2. How often must you stop while on the road to check your cargo?
3. How is **Gross Combination Weight Rating** different from **Gross Combination Weight**?
4. Name two situations where legal maximum weights may not be safe.
5. What can happen if you don't have enough weight on the front axle?

*These questions may be on your test. If you can't answer them all, re-read Sections 3.1 and 3.2.*

## 3.3 Securing Cargo

### Blocking and Bracing

Blocking is used in the front, back, and/or sides of a piece of cargo to keep it from sliding. Blocking is shaped to fit snugly against cargo. It is secured to the cargo deck to prevent cargo movement. **Bracing** is also used to prevent movement of cargo. Bracing goes from the upper part of the cargo to the floor and/or walls of the cargo compartment.

### Cargo Tiedown

On flatbed trailers or trailers without sides, cargo must be secured to keep it from shifting or falling off. In closed vans, tiedowns can also be important to prevent cargo shifting that may affect the handling of the vehicle. Tiedowns must be of the proper type and proper strength. The combined strength of all cargo tiedowns must be strong enough to lift one and one half times the weight of the piece of cargo tied down. Proper tiedown equipment must be used, including ropes, straps, chains, and tensioning devices (winches, ratchets, clinching components). Tiedowns must be attached to the vehicle correctly (hook, bolt, rails, rings).

Cargo should have at least one tiedown for each 10 feet of cargo. Make sure you have enough tiedowns to meet this need. No matter how small the cargo, it should have at least two tiedowns holding it.

There are special requirements for securing various heavy pieces of metal. Find out what they are if you are to carry such loads.

## **Header Boards**

Front end header boards ("headache racks") protect you from your cargo in case of a crash or emergency stop. Make sure the front end structure is in good condition. The front end structure should block the forward movement of any cargo you carry.

## **Covering Cargo**

There are two basic reasons for covering cargo, (1) to protect people from spilled cargo, and (2) to protect the cargo from weather. Spill protection is a safety requirement in many states. Be familiar with the laws in the states you drive in.

You should look at your cargo covers in the mirrors from time to time while driving. A flapping cover can tear loose, uncovering the cargo, and possibly block your view or someone else's.

You cannot inspect sealed loads, but you should check that you don't exceed gross weight and axle weight limits.

## **Sealed & Containerized Loads**

Containerized loads generally are used when freight is carried part way by rail or ship. Delivery by truck occurs at the beginning and/or end of the journey. Some containers have their own tiedown devices or locks that attach directly to a special frame. Others have to be loaded onto flat bed trailers. They must be properly secured just like any other cargo.

## **3.4 Other Cargo Needing Special Attention**

**Dry bulk tanks** require special care because they often have a high center of gravity, and the load can shift. Be extremely cautious (slow and careful) going around curves and making sharp turns.

**Hanging meat** (suspended beef, pork, lamb) in a refrigerated truck can be a very unstable load with a high center of gravity. Particular caution is needed on sharp curves such as off ramps and on ramps. Go slow.

**Livestock** can move around in a trailer, causing unsafe handling. With less than a full load, use false bulkheads to keep livestock bunched together. Even when bunched, special care is necessary because livestock can lean on curves. This shifts the center of gravity and makes rollover more likely.

**Over length, over width, and/or over weight loads** require special transit permits. Driving is usually limited to certain times. Special equipment may be necessary such as "wide load" signs, flashing lights, flags, etc. Such loads may require a police escort or pilot vehicles bearing warning signs and/or flashing lights. These special loads require special driving care.

## **Test Your Knowledge**

1. What is the minimum number of tiedowns for any flat bed load?
2. What is the minimum number of tiedowns for a 20 ft. load?
3. Name the two basic reasons for covering cargo on an open bed.
4. What must you check before transporting a sealed load?

*These questions may be on your test. If you can't answer them all, re-read Sections 3.3 and 3.4.*

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[Previous](#) [Next](#)

# Section 4: Transporting Passengers

## **This section is for Drivers needing a Passenger Endorsement**

Bus drivers must have a commercial driver's license if they drive a vehicle designed to seat more than 15 persons, including the driver.

Bus drivers must have a passenger endorsement on their commercial driver's license. To get the endorsement you must pass a knowledge test on Sections 2 and 4 of this manual. (If your bus has air brakes, you must also pass a knowledge test on Section 5.) You must also pass the skills tests required for the class of vehicle you drive.

## **4.1 Pre-trip Inspection**

Before driving your bus, you must be sure it is safe. You must review the inspection report made by the previous driver. Only if defects reported earlier have been certified as repaired or not needed to be repaired, should you sign the previous driver's report. This is your certification that the defects reported earlier have been fixed.

### **Vehicle Systems**

Make sure these things are in good working order before driving:

- Service brakes, including air hose couplings (if your bus has a trailer or semi-trailer).
- Parking brake.
- Steering mechanism.
- Lights and reflectors.
- Tires (front wheels must not have recapped or regrooved tires).
- Horn.
- Windshield wiper or wipers.
- Rear-vision mirror or mirrors.
- Coupling devices (if present).
- Wheels and rims.
- Emergency Equipment.

### **Access Doors & Panels**

As you check the outside of the bus, close any open emergency exits. Also, close any open access panels (for baggage, restroom service, engine, etc) before driving.

### **Bus Interior**

People sometimes damage unattended buses. Always check the interior of the bus before driving to ensure rider safety. Aisles and stairwells should always be clear. The following parts of your bus must be in safe working condition:

- Each handhold and railing.



- Floor covering.
- Signaling devices, including the restroom emergency buzzer, if the bus has a restroom.
- Emergency exit handles.

The seats must be safe for riders. All seats must be securely fastened to the bus.

Never drive with an open emergency exit door or window. The "Emergency Exit" sign on an emergency door must be clearly visible. If there is a red emergency door light, it must work. Turn it on at night or any other time you use your outside lights.

## Roof Hatches

You may lock some emergency roof hatches in a partly open position for fresh air. Do not leave them open as a regular practice. Keep in mind the bus's higher clearance while driving with them open.

Make sure your bus has the fire extinguisher and emergency reflectors required by law. The bus must also have spare electrical fuses, unless equipped with circuit breakers.

## Use Your Seatbelt!

The driver's seat should have a seat belt. Always use it for safety.

## 4.2 Loading and Trip Start

Do not allow riders to leave carry-on baggage in a doorway or aisle. There should be nothing in the aisle that might trip other riders. Secure baggage and freight in ways that avoid damage and:

- Allow the driver to move freely and easily.
- Allow riders to exit by any window or door in an emergency.
- Protect riders from injury if carry-ons fall or shift.

## Hazardous Materials

Watch for cargo or baggage containing hazardous materials. Most hazardous materials cannot be carried on a bus.

The Federal Hazardous Materials Table shows which materials are hazardous. They pose a risk to health, safety, and property during transportation. The rules require shippers to mark containers of hazardous material with the material's name, ID number, and hazard label. There are 9 different 4 inch, diamond-shaped hazard labels like the examples shown in Figure 4-1. Watch for the diamond-shaped labels. Do not transport any hazardous material unless you are sure the rules allow it.

Buses may carry small-arms ammunition labeled ORM-D, emergency hospital supplies, and drugs. You can carry small amounts of some other hazardous materials if the shipper cannot send them any other way. Buses must **never** carry:

## Forbidden Hazardous Materials

- Class 2 poison, **liquid** Class 6 poison, tear gas, irritating material.
- More than 100 pounds of **solid** Class 6 poisons.

- Explosives in the space occupied by people, except small arms ammunition.
- Labeled radioactive materials in the space occupied by people.
- More than 500 pounds total of allowed hazardous materials, and no more than 100 pounds of any one class.

Riders sometimes board a bus with an unlabeled hazardous material. They may not know it is unsafe. Do not allow riders to carry on common hazards such as car batteries or gasoline.

No rider may stand forward of the rear of the driver's seat. Buses designed to allow standing must have a 2 inch line on the floor or some other means of showing riders where they cannot stand. This is called the standee line. All standing riders must stay behind it.

## **At Your Destination**

When arriving at the destination or intermediate stops announce:

- The location,
- Reason for stopping,
- Next departure time, and
- Bus number.

Remind riders to take carry-ons with them if they get off the bus. If the aisle is on a lower level than the seats, remind riders of the step-down. It is best to tell them before coming to a complete stop.

Charter bus drivers should not allow riders on the bus until departure time. This will help prevent theft or vandalism of the bus.

## **Test Your Knowledge**

1. Name some things to check in the interior of a bus during a pre-trip inspection.
2. What are some hazardous materials you **can** transport by bus?
3. What are some hazardous materials you **can't** transport by bus?
4. What is a standee line?

*These questions may be on your test. If you can't answer them all, re-read Sections 4.1 and 4.2.*

## **4.3 On the Road**

### **Passenger Supervision**

Many charter and intercity carriers have passenger comfort and safety rules. Mention rules about smoking, drinking, or use of radio and tape players at the start of the trip. Explaining the rules at the start will help to avoid trouble later on.

While driving, scan the interior of your bus as well as the road ahead, to the sides, and to the rear. You may have to remind riders about rules, or to keep arms and heads inside the bus.

### **At Stops**

Riders can stumble when getting on or off and when the bus starts or stops. Caution riders to watch their

step when leaving the bus. Wait for them to sit down or brace themselves before starting. Starting and stopping should be as smooth as possible to avoid rider injury.

Occasionally, you may have a drunk or disruptive rider. You must ensure this rider's safety as well as that of others. Don't discharge such riders where it would be unsafe for them. It may be safer at the next scheduled stop or a well-lighted area where there are other people. Many carriers have guidelines for handling disruptive riders.

## Common Accidents

**The most common bus crashes.** Bus crashes often happen at intersections. Use caution, even if a signal or stop sign controls other traffic. School and mass transit buses sometimes scrape off mirrors or hit passing vehicles when pulling out from a bus stop. Remember the clearance your bus needs, and watch for poles and tree limbs at stops. Know the size of the gap your bus needs to accelerate and merge with traffic. Wait for the gap to open before leaving the stop. Never assume other drivers will brake to give you room when you signal or start to pull out.

## Speed on Curves

Crashes on curves that kill people and destroy buses result from excessive speed, often when rain or snow has made the road slippery. Every banked curve has a safe "design speed." In good weather, the posted speed is safe for cars but it may be too high for many buses. With good traction, the bus may roll over; with poor traction, it might slide off the curve. Reduce speed for curves! If your bus leans toward the outside on a banked curve, you are driving too fast.

## Railroad Crossings Stops

**Stop at RR crossings.** Stop your bus between 15 and 50 feet before railroad crossings. Listen and look in both directions for trains. You should open your forward door if it improves your ability to see or hear an approaching train. Before crossing after a train has passed, make sure there isn't another train coming in the other direction on other tracks. If your bus has a manual transmission, never change gears while crossing the tracks.

You do not have to stop, but must slow down and carefully check for other vehicles:

- At street car crossings.
- At railroad tracks used only for industrial switching within a business district.
- Where a policeman or flagman is directing traffic.
- If a traffic signal shows green, and
- At crossings marked as "exempt" or "abandoned."

## Drawbridge

**Stop at drawbridges.** Stop at drawbridges that do not have a signal light or traffic control attendant. Stop at least 50 feet before the draw of the bridge. Look to make sure the draw is completely closed before crossing. You do not need to stop, but must slow down and make sure it's safe, when:

- there is a traffic light showing green.
- the bridge has an attendant or traffic officer that controls traffic whenever the bridge opens.

## 4.4 After-trip Vehicle Inspection

Inspect your bus at the end of each shift. If you work for an interstate carrier, you must complete a written inspection report for each bus driven. The report must specify each bus and list any defect that would affect safety or result in a breakdown. If there are no defects, the report should say so.

Riders sometimes damage safety-related parts such as hand-holds, seats, emergency exits, and windows. If you report this damage at the end of a shift, mechanics can make repairs before the bus goes out again. Mass transit drivers should also make sure passenger signaling devices and brake-door interlocks work properly.

## 4.5 Prohibited Practices

Avoid fueling your bus with riders on board unless absolutely necessary. Never refuel in a closed building with riders on board.

Don't talk with riders, or engage in any other distracting activity, while driving.

Do not tow or push a disabled bus with riders aboard the vehicle, unless getting off would be unsafe. Only tow or push the bus to the nearest safe spot to discharge passengers. Follow your employer's guidelines on towing or pushing disabled buses.

## 4.6 Use of Brake-door Interlocks

Urban mass transit coaches may have a brake and accelerator interlock system. The interlock applies the brakes and holds the throttle in idle position when the rear door is open. The interlock releases when you close the rear door. Do not use this safety feature in place of the parking brake.

## Test Your Knowledge

1. Does it matter where you make a disruptive passenger get off the bus?
2. How far from a railroad crossing should you stop?
3. When must you stop before crossing a drawbridge?
4. Describe from memory the "prohibited practices" listed above.
5. The rear door of a transit bus has to be open to put on the parking brake. True or False?

*These questions may be on your test. If you can't answer them all, re-read [Sections 4.3, 4.4, 4.5, and 4.6](#).*

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# Section 5: Air Brakes

This section tells you about air brakes. If you want to drive a truck or bus with air brakes, or pull a trailer with air brakes, you need to read this section. If you want to pull a trailer with air brakes, you also need to read [Section 6: Combination Vehicles](#).

Air brakes use **compressed air** to make the brakes work. Air brakes are a good and safe way of stopping large and heavy vehicles, but the brakes must be well maintained and used properly.

Air brakes are really three different braking systems: service brake, parking brake, and emergency brake systems.

- The **service brake** system applies and releases the brakes when you use the brake pedal during normal driving.
- The **parking brake** system applies and releases the parking brakes when you use the parking brake control.
- The **emergency brake** system uses parts of the service and parking brake systems to stop the vehicle in the event of a brake system failure.

The parts of these systems are discussed in greater detail below.

## 5.1 The Parts of an Air Brake System

There are many parts to an air brake system. You should know about the parts discussed here.

### Air Compressor

The air compressor pumps air into the air storage tanks (reservoirs). The air compressor is connected to the engine through gears or a V-belt. The compressor may be air cooled or may be cooled by the engine cooling system. It may have its own oil supply, or be lubricated by engine oil. If the compressor has its own oil supply, check the oil level before driving.

### Air Compressor Governor

The governor controls when the air compressor will pump air into the air storage tanks. When air tank pressure rises to the "cut-out" level (around 125 pounds per square inch or "psi"), the governor stops the compressor from pumping air. When the tank pressure falls to the "cut-in" pressure (around 100 psi), the governor allows the compressor to start pumping again.

### Air Storage Tanks

Air storage tanks are used to hold compressed air. The number and size of air tanks varies among vehicles. The tanks will hold enough air to allow the brakes to be used several times even if the compressor stops working.

### Air Tank Drains

Compressed air usually has some water and some compressor oil in it which is bad for the air brake system. For example, the water can freeze in cold weather and cause brake failure. The water and oil tend

to collect in the bottom of the air tank. Be sure that you drain the air tanks completely. Each air tank is equipped with a drain valve in the bottom. There are two types:

- Manually operated by turning a quarter turn, shown in Figure 5-1, or by pulling a cable. You must drain the tanks yourself at the end of each day of driving.
- Automatic - the water and oil is automatically expelled. They may be equipped for manual draining as well.

The automatic types are available with electric heating devices. These help prevent freeze up of the automatic drain in cold weather.

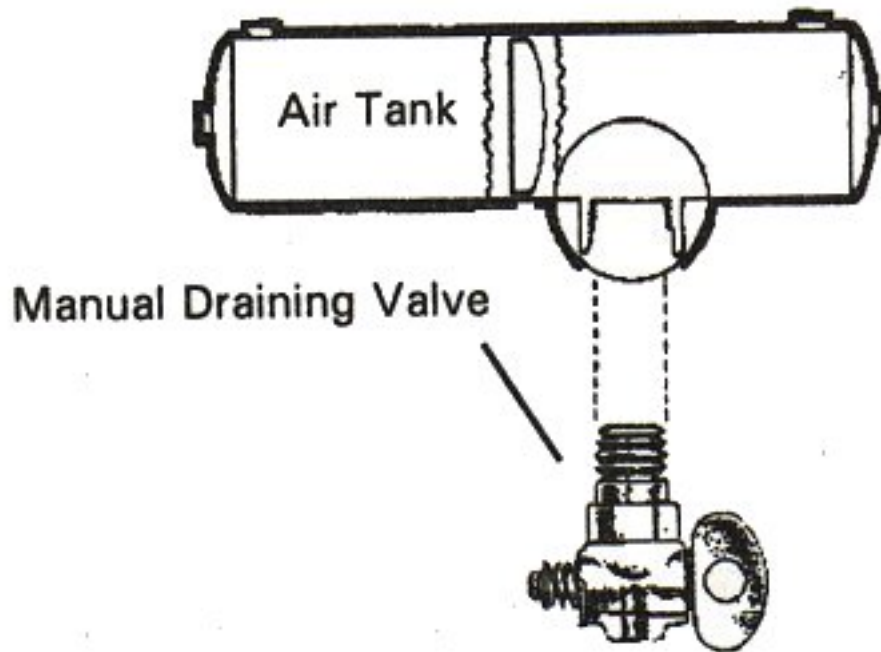


Figure 5-1

Manual Drain Valve

## Alcohol Evaporator

Some air brake systems have an alcohol evaporator to put alcohol into the air system. This helps to reduce the risk of ice in air brake valves and other parts during cold weather. Ice inside the system can make the brakes stop working.

Check the alcohol container and fill up as necessary, every day during cold weather. **Daily air tank drainage is still needed to get rid of water and oil.** (Unless the system has automatic drain valves.)

## Safety Valve

A safety relief valve is installed in the first tank the air compressor pumps air to. The safety valve protects the tank and the rest of the system from too much pressure. The valve is usually set to open at 150 psi. If the safety valve releases air, something is wrong. Have the fault fixed by a mechanic.

## The Brake Pedal

You put on the brakes by pushing down the brake pedal. (It is also called the foot valve or treadle valve.) Pushing the pedal down harder applies more air pressure. Letting up on the brake pedal reduces the air pressure and releases the brakes. Releasing the brakes lets some compressed air go out of the system, so the air pressure in the tanks is reduced. It must be made up by the air compressor. Pressing and releasing the pedal unnecessarily can let air out faster than the compressor can replace it. If the pressure gets too



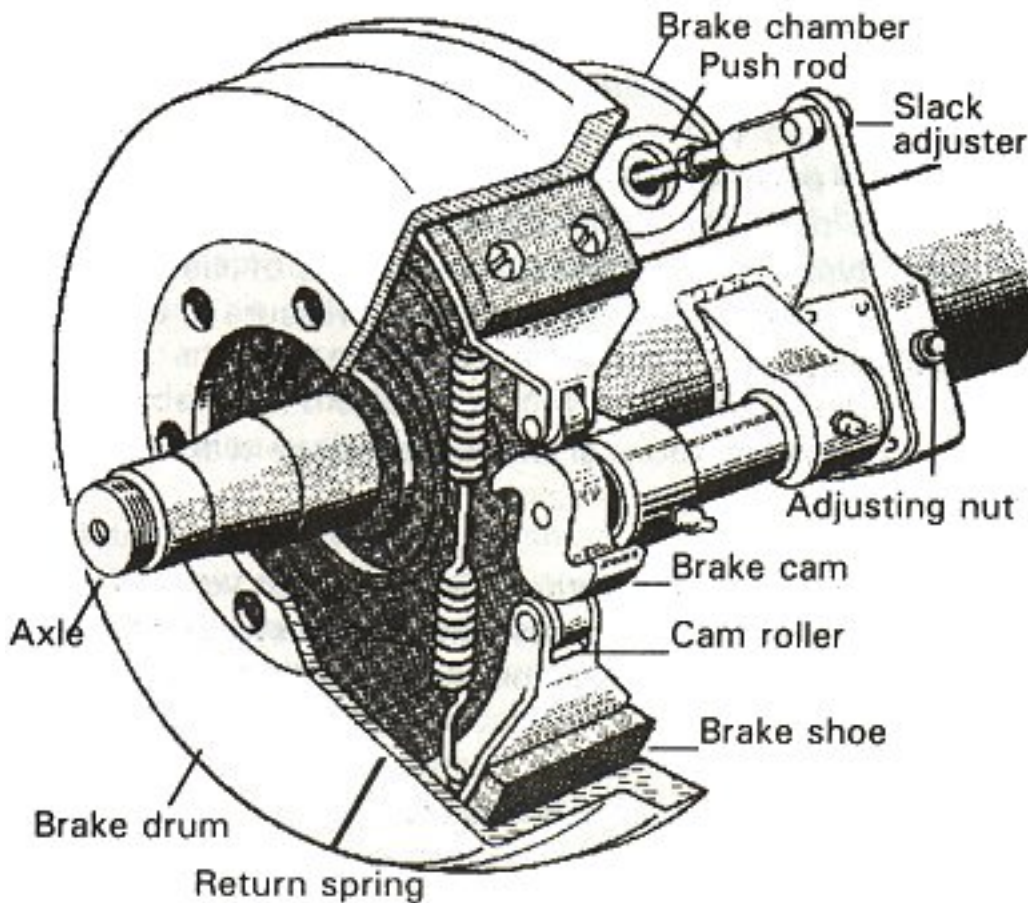
low, the brakes won't work.

## Foundation Brakes

Foundation brakes are used at each wheel. The most common type is the S-cam drum brake, shown in Figure 5-2. The parts of the brake are discussed below:

**Brake drums, shoes, and linings.** Brake drums are located on each end of the vehicle's axles. The wheels are bolted to the drums. The braking mechanism is inside the drum. To stop, the brake shoes and linings are pushed against the inside of the drum. This causes friction which slows the vehicle (and creates heat). The heat a drum can take without damage depends on how hard and how long the brakes are used. Too much heat can make the brakes stop working.

**S-Cam Brakes.** When you push the brake pedal, air is let into each brake chamber (see Figure 5-2). Air pressure pushes the rod out, moving the slack adjuster, thus twisting the brake camshaft. This turns the S-cam (so called because it is shaped like the letter "S"). The S-cam forces the brake shoes away from one another and presses them against the inside of the brake drum. When you release the brake pedal, the S-cam rotates back and a spring pulls the brake shoes away from the drum, letting the wheels roll freely



again.

Figure 5-2

S-cam Air Brake

**Wedge brakes.** In this type brake, the brake chamber push rod pushes a wedge directly between the ends of two brake shoes. This shoves them apart and against the inside of the brake drum. Wedge brakes may have a single brake chamber, or two brake chambers, pushing wedges in at both ends of the brake shoes. Wedge type brakes may be self-adjusting or may require manual adjustment.



**Disc brakes.** In air-operated disc brakes, air pressure acts on a brake chamber and slack adjuster, like S-cam brakes. But instead of the S-cam, a "power screw" is used. The pressure of the brake chamber on the slack adjuster turns the power screw. The power screw clamps the disc or rotor between the brake lining pads of a caliper, similar to a large C-clamp.

Wedge brakes and disc brakes are less common than S-cam brakes.

## **Supply Pressure Gauges**

All air-braked vehicles have a pressure gauge connected to the air tank. If, the vehicle has a dual air brake system, there will be a gauge for each half of the system. (Or a single gauge with two needles.) Dual systems will be discussed later. These gauges tell you how much pressure is in the air tanks.

## **Application Pressure Gauges**

This gauge shows how much air pressure you are applying to the brakes. (This gauge is not on all vehicles.) Increasing application pressure to hold the same speed means the brakes are fading. You should slow down and use a lower gear. The need for increased pressure can also be caused by brakes out of adjustment, air leaks, or mechanical problems.

## **Low Air Pressure Warning**

A low air pressure warning signal is required on vehicles with air brakes. A warning signal you can see must come on before the air pressure in the tanks falls below 60 psi. (Or one half the compressor governor cutout pressure on older vehicles.) The warning is usually a red light. A buzzer may also come on.

Another type of warning is the "wig wag." This device drops a mechanical arm into your view when the pressure in the system drops below 60 psi. An automatic wig wag will rise out of your view when the pressure in the system goes above 60 psi. The manual reset type must be placed in the "out of view" position manually. It will not stay in place until the pressure in the system is above 60 psi.

On large buses it is common for the low pressure warning devices to signal at 80-85 psi.

## **Stop Light Switch**

Drivers behind you must be warned when you put your brakes on. The air brake system does this with an electric switch that works by air pressure. The switch turns on the brake lights when you put on the air brakes.

## **Front Brake Limiting Valve**

Some older vehicles (made before 1975) have a front brake limiting valve and a control in the cab. The control is usually marked "normal" and "slippery." When you put the control in the "slippery" position, the limiting valve cuts the "normal" air pressure to the front brakes by half. Limiting valves were used to reduce the chance of the front wheels skidding on slippery surfaces. However, they actually reduce the stopping power of the vehicle. Front wheel braking is good under all conditions. Tests have shown front wheel skids from braking are not likely even on ice. **Make sure the control is in the "normal" position to have normal stopping power.**

Many vehicles have automatic front wheel limiting valves. They reduce the air to the front brakes except

when the brakes are put on very hard (60 psi or more application pressure). These valves cannot be controlled by the driver.

## Spring Brakes

All trucks, truck tractors, and buses must be equipped with emergency brakes and parking brakes. They must be held on by mechanical force (because air pressure can eventually leak away). Spring brakes are usually used to meet these needs. When driving, powerful springs are held back by air pressure. If the air pressure is removed, the springs put on the brakes. A parking brake control in the cab allows the driver to let the air out of the spring brakes. This lets the springs put the brakes on. A leak in the air brake system which causes all the air to be lost will also cause the springs to put on the brakes.

Tractor and straight truck spring brakes will come fully on when air pressure drops to a range of 20 to 45 psi (typically 20 to 30 psi). Do not wait for the brakes to come on automatically. When the low air pressure warning light and buzzer first come on, bring the vehicle to a safe stop right away, while you can still control the brakes.

The braking power of spring brakes depends on the brakes being in adjustment. If the brakes are not adjusted properly, neither the regular brakes nor the emergency/parking brakes will work right.

In newer vehicles with air brakes, you put on the parking brakes using a **diamond-shaped, yellow, push-pull control knob**. You pull the knob out to put the parking brakes (spring brakes) on, and push it in to release them. On older vehicles, the parking brakes may be controlled by a lever. Use the parking brakes whenever you park.

**Caution.** Never push the brake pedal down when the spring brakes are on. If you do, the brakes could be damaged by the combined forces of the springs and the air pressure. Many brake systems are designed so this will not happen. But not all systems are set up that way, and those that are may not always work. It is much better to develop the habit of not pushing the brake pedal down when the spring brakes are on.

**Modulating control valves.** In some vehicles a control handle on the dash board may be used to apply the spring brakes gradually. This is called a modulating valve. It is spring loaded so you have a feel for the braking action. The more you move the control lever, the harder the spring brakes come on. They work this way so you can control the spring brakes if the service brakes fail. When parking a vehicle with a modulating control valve, move the lever as far as it will go and hold it in place with the locking device.

## Parking Brake Controls

**Dual parking control valves.** When main air pressure is lost, the spring brakes come on. Some vehicles, such as buses, have a separate air tank which can be used to release the spring brakes. This is so you can move the vehicle in an emergency. One of the valves is a push-pull type and is used to put on the spring brakes for parking. The other valve is spring loaded in the "out" position. When you push the control in, air from the separate air tank releases the spring brakes so you can move. When you release the button, the spring brakes come on again. There is only enough air in the separate tank to do this a few times. Therefore, plan carefully when moving. Otherwise, you may be stopped in a dangerous location when the separate air supply runs out.

## Test Your Knowledge

1. Why must air tanks be drained?
2. What is a supply pressure gauge used for?
3. All vehicles with air brakes must have a low air pressure warning signal. True or False'?
4. What are spring brakes?
5. Front wheel brakes are good under all conditions. True or False?

*These questions may be on your test. If you can't answer them all, re-read Section 5.1.*

## 5.2 Dual Air Brake

Most newer heavy-duty vehicles use dual air brake systems for safety. A dual air brake system has two separate air brake systems which use a single set of brake controls. Each system has its own air tanks, hoses, lines, etc. One system typically operates the regular brakes on the rear axle or axles. The other system operates the regular brakes on the front axle (and possibly one rear axle). Both systems supply air to the trailer (if there is one). The first system is called the "primary" system. The other is called the "secondary" system.

Before driving a vehicle with a dual air system, allow time for the air compressor to build up a minimum of 100 psi pressure in both the primary and secondary systems. Watch the primary and secondary air pressure gauges (or needles, if the system has two needles in one gauge). Pay attention to the low air pressure warning light and buzzer. The warning light and buzzer should shut off when air pressure in both systems rises to a value set by the manufacturer. This value must be greater than 60 psi.

The warning light and buzzer should come on before the air pressure drops below 60 psi in either system. If this happens while driving, you should stop right away and safely park the vehicle. If one air system is very low on pressure, either the front or the rear brakes will not be operating fully. This means it will take you longer to stop. Bring the vehicle to a safe stop and have the air brakes system fixed.

## 5.3 Inspecting Air Brake Systems

You should use the basic seven-step inspection procedure described in Section 2 to inspect your vehicle. There are more things to inspect on a vehicle with air brakes than one without them. We discuss these things below, in the order that they fit into the seven-step method.

### **During Step 2 Engine Compartment Checks**

**Check Air Compressor Drive Belt (if compressor is belt driven).** If the air compressor is belt-driven, check the condition and tightness of the belt. The belt should be in good condition.

### **During Step 5 Walkaround Inspecting**

**Check Manual Slack Adjusters on S-Cam Brakes.** Park on level ground and chock the wheels to prevent the vehicle from moving. Turn off the parking brakes so you can move the slack adjusters. Use gloves and pull hard on each slack adjuster that you can get to. If a slack adjuster moves more than about one inch where the push rod attaches to it, it probably needs adjustment. Adjust it or have it adjusted. Vehicles with too much brake slack can be very hard to stop. Out-of-adjustment brakes are the most common problem found in roadside inspections. Be safe. Check the slack adjusters.

**Check Brake Drums (or Discs), Linings, and Hoses.** Brake drums (or discs) must not have cracks longer than one half the width of the friction area. Linings (friction material) must not be loose or soaked with oil or grease. They must not be dangerously thin. Mechanical parts must be in place, not broken or missing. Check the air hoses connected to the brake chambers to make sure they aren't cut or worn due to rubbing.

Do the following checks instead of the hydraulic brake check shown in Section Two "Step 7: Check Brake System."

**Test Low Pressure Warning Signal.** Shut the engine off when you have enough air pressure so that the low pressure warning signal is not on. Turn the electrical power on and step on and off the brake pedal to reduce air tank pressure. The low air pressure warning signal must come on before the pressure drops to less than 60 psi in the air tank (or tank with the lowest air pressure, in dual air systems).

If the warning signal doesn't work, you could lose air pressure and you would not know it. This could cause sudden emergency braking in a single circuit air system. In dual systems the stopping distance will be increased. Only limited braking can be done before the spring brakes come on.

**Check that the Spring Brakes Come on Automatically.** Chock the wheels, release the parking brakes when you have enough air pressure to do it, and shut the engine off. Step on and off the brake pedal to reduce the air tank pressure. The "parking brake" knob should pop out when the air pressure falls to the manufacturer's specification (usually in a range between 20-40 psi). This causes the spring brakes to come on.

**Check Rate of Air Pressure Buildup.** When the engine is at operating RPM, the pressure should build from 85 to 100 psi within 45 seconds in dual air systems. (If the vehicle has larger than minimum air tanks, the buildup time can be longer and still be safe. Check the manufacturer's specifications.) In single air systems (pre-1975), typical requirements are pressure buildup from 50 to 90 psi within 3 minutes with the engine at an idle speed of 600-900 RPM.

If air pressure does not build up fast enough, your pressure may drop too low during driving, requiring an emergency stop. Don't drive until you get the problem fixed.

**Test Air Leakage Rate.** With a fully-charged air system (typically 125 psi), turn off the engine, release the service brake, and time the air pressure drop. The loss rate should be less than 2 psi in one minute for single vehicles and less than 3 psi in one minute for combination vehicles. Then apply 90 psi or more with the brake pedal. After the initial pressure drop, if the air pressure falls more than 3 psi in one minute for single vehicles (more than 4 psi for combination vehicles), the air loss rate is too much. Check for air leaks and fix before driving the vehicle. Otherwise, you could lose your brakes while driving.

## **Step 7 Check Air Brake Check**

**Compressor Governor Cut-in and Cut-out Pressures.** Pumping by the air compressor should start at about 100 psi and stop at about 125 psi. (Check manufacturer's specifications.) Run the engine at a fast idle. The air governor should cut-out the air compressor at about the manufacturer's specified pressure. The air pressure shown by your gauge(s) will stop rising. With the engine idling, step on and off the brake to reduce the air tank pressure. The compressor should cut-in at about the manufacturer's specified cut-in pressure. The pressure should begin to rise.

If the air governor does not work as described above, it may need to be fixed. A governor that does not work properly may not keep enough air pressure for safe driving.

**Test Parking Brake.** Stop the vehicle, put the parking brake on, and gently pull against it in a low gear to test that the parking brake will hold.

**Test Service Brakes.** Wait for normal air pressure, release the parking brake, move the vehicle forward slowly (about 5 mph), and apply the brakes firmly using the brake pedal. Note any vehicle "pulling" to one side, unusual feel, or delayed stopping action.

This test may show you problems which you otherwise wouldn't know about until you needed the brakes on the road.

### Test Your Knowledge

1. What is a dual air brake system?
2. What are the slack adjusters?
3. How can you check slack adjusters?
4. How can you test the low pressure warning signal?
5. What can you check that the spring brakes come on automatically?
6. What are the maximum leakage rates?

*These questions may be on your test. If you can't answer them all, re-read Sections 5.2 and 5.3.*

## 5.4 Using Air Brakes

### Normal Stops

Push the brake pedal down. Control the pressure so the vehicle comes to a smooth, safe stop. If you have a manual transmission, don't push the clutch in until the engine RPM is down close to idle. When stopped, select a starting gear.

### Emergency Stops

If somebody suddenly pulls out in front of you, your natural response is to hit the brakes. This is a good response if there's enough distance to stop and you use the brakes correctly.

You should brake in a way that will keep your vehicle in a straight line and allow you to turn if it becomes necessary. You can use the "controlled braking" method or the "stab braking" method.

**Controlled braking.** With this method, you apply the brakes as hard as you can without locking the wheels. Keep steering wheel movements very small while doing this. If you need to make a larger steering adjustment or if the wheels lock, release the brakes. Re-apply the brakes as soon as you can.

**Stab braking.** (Only on vehicles without anti-lock brake systems.)

- Apply your brakes all the way.
- Release brakes when wheels lock up.
- As soon as the wheels start rolling, apply the brakes fully again. (It can take up to one second for



the wheels to start rolling after you release the brakes. If you re-apply the brakes before the wheels start rolling, the vehicle won't straighten out.)

**Note: If you drive a vehicle with anti-lock brakes, you should read and follow the directions found in the owner's manual for stopping quickly.**

## **Stopping Distance**

We talked about stopping distance in Section 2 under "Speed and Stopping Distance." With air brakes there is an added delay: the time required for the brakes to work after the brake pedal is pushed. With hydraulic brakes (used on cars and light/medium trucks), the brakes work instantly. However, with air brakes, it takes a little time (one half second or more) for the air to flow through the lines to the brakes. Thus, the total stopping distance for vehicles with air brake systems is made up of four different factors.

Perception Distance  
+ Reaction Distance  
+ Brake Lag Distance  
+ Effective Braking Distance  
= Total Stopping Distance

The air brake lag distance at 55 mph on dry pavement adds about 32 feet. So at 55 mph for an average driver under good traction and brake conditions, the total stopping distance is over 300 feet. This is longer than a football field.

## **Brake Fading or Failure**

Brakes are designed so brake shoes or pads rub against the brake drum or disks to slow the vehicle. Braking creates heat, but brakes are designed to take a lot of heat. However, brakes can fade or fail from excessive heat caused by using them too much and not relying on the engine braking effect.

Excessive use of the service brakes results in overheating and leads to brake fade. Brake fade results from excessive heat causing chemical changes in the brake lining which reduce friction and also causing expansion of the brake drums. As the overheated drums expand, the brake shoes and linings have to move farther to contact the drums, and the force of this contact is also reduced. Continued overuse may increase brake fade until the vehicle cannot be slowed down or stopped at all.

Brake fade is also affected by adjustment. To safely control a vehicle, every brake must do its share of the work. Brakes out of adjustment will stop doing their share before those that are in adjustment. The other brakes can then overheat and fade and there will not be sufficient braking available to control the vehicle(s). Brakes can get out of adjustment quickly, especially when they are hot. Therefore, brake adjustment must be checked frequently.

## **Proper Braking Technique**

Remember: The use of brakes on a long and/or steep downgrade is only a supplement to the braking effect of the engine. Once the vehicle is in the proper low gear, the following is the proper braking technique:

- Apply the brakes just hard enough to feel a definite slowdown.
- When your speed has been reduced to approximately 5 m.p.h. below your "safe" speed, release the

brakes. [This brake application should last for about three (3) seconds.]

- When your speed has increased to your "safe" speed, repeat steps 1 and 2.

For example, if your "safe" speed is 40 m.p.h., you would not apply the brakes until your speed reaches 40 m.p.h. You now apply the brakes hard enough to gradually reduce your speed to 35 m.p.h. and then release the brakes. Repeat this as often as necessary until you have reached the end of the downgrade.

## Low Air Pressure

If the low air pressure warning comes on, **stop and safely park your vehicle as soon as possible.** There might be an air leak in the system. Controlled braking is possible only while enough air remains in the air tanks. The spring brakes will come on when the air pressure drops into the range of 20 to 45 psi. A heavily loaded vehicle will take a long distance to stop because the spring brakes do not work on all axles. Lightly loaded vehicles or vehicles on slippery roads may skid out of control when the spring brakes come on. It is much safer to stop while there is enough air in the tanks to use the foot brakes.

## Parking Brakes

**Any time you park, use the parking brakes,** except as noted below. Pull the parking brake control knob out to apply the parking brakes, push it in to release them. The control will be a yellow, diamond-shaped knob labeled "parking brakes" on newer vehicles. On older vehicles, it may be a round blue knob or some other shape (including a lever that swings from side to side or up and down).

Don't use the parking brakes if the brakes are very hot (from just having come down a steep grade), or if the brakes are very wet in freezing temperatures. If they are used while they are very hot, they can be damaged by the heat. If they are used in freezing temperatures when the brakes are very wet, they can freeze so the vehicle can not move. Use wheel chocks to hold the vehicle. Let hot brakes cool before using the parking brakes. If the brakes are wet; use the brakes lightly while driving in a low gear to heat and dry them.

If your vehicle does not have automatic air tank drains, drain your air tanks at the end of each working day to remove moisture and oil. Otherwise, the brakes could fail.

Never leave your vehicle unattended without applying the parking brakes or chocking the wheels. Your vehicle might roll away and cause injury and damage.

## Test Your Knowledge

1. Why should you be in the proper gear before starting down a hill?
2. What factors can cause brakes to fade or fail?
3. The use of brakes on a long steep downgrade is only a supplement to the braking effect of the engine. True or False?
4. If you are away from your vehicle only a short time, you don't need to use the parking brake. True or False?
5. How often should you drain air tanks?

*These questions may be on your test. If you can't answer them all, re-read Section 5.4.*

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# Section 6: Combination Vehicles

This section provides information needed to pass the tests for combination vehicles (tractor-trailer, doubles, triples, straight truck and trailer). The information is only to give you the minimum knowledge needed for driving common combination vehicles. You should also study Section 7 if you need to pass the tests for doubles-triples.

## 6.1 Driving Combination Vehicles Safely

Combination vehicles are usually heavier, longer, and require more driving skill than single commercial vehicles. This means that drivers of combination vehicles need more knowledge and skill than drivers of single vehicles. In this section, we talk about some important safety factors that apply specifically to combination vehicles.

### Rollover Risks

More than half of truck driver deaths in crashes are the result of truck rollovers. When more cargo is piled up in a truck, the "center of gravity" moves higher up from the road. The truck becomes easier to turn over. Fully loaded rigs are 10 times more likely to roll over in a crash than empty rigs.

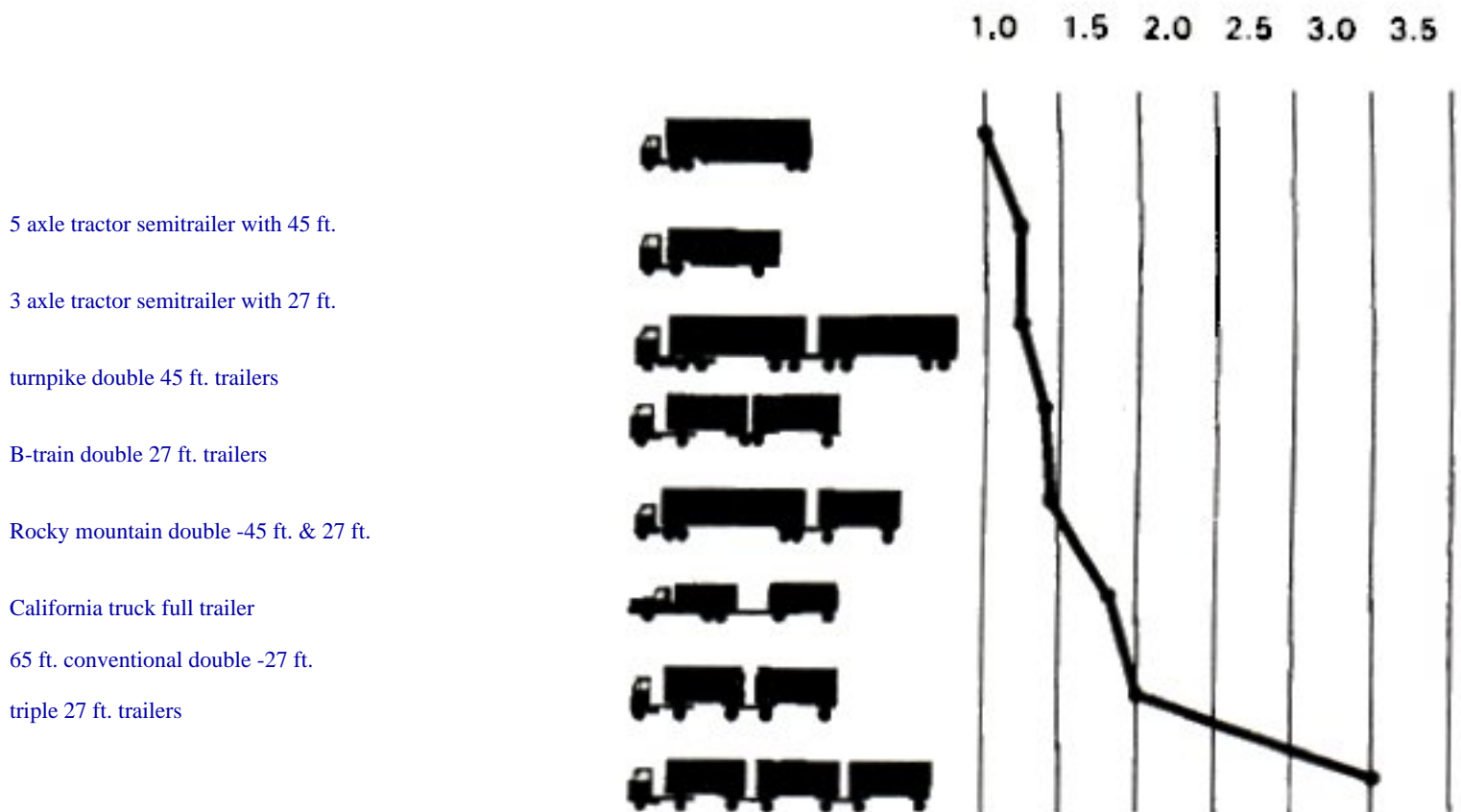
The following two things will help you prevent a rollover: **keep the cargo as close to the ground as possible, and drive slowly around turns.** Keeping cargo low is even more important in combination vehicles than in straight trucks. Also, keep the load centered on your rig. If the load is to one side so it makes a trailer lean, a rollover is more likely. Make sure your cargo is centered and spread out as much as possible. (Cargo distribution is covered in Section 3 of this manual.)

Rollovers happen when you turn too fast. Drive slowly around corners, on ramps, and off ramps. Avoid quick lane changes, especially when fully loaded.

### Steer Gently

Trucks with trailers have a dangerous "crack-the-whip" effect. When you make a quick lane change, the crack-the-whip effect can turn the trailer over. There are many accidents where only the trailer has overturned.

"Rearward amplification" causes the crack-the-whip effect. Figure 6-1 shows eight types of combination vehicles and the rearward amplification each has in a quick lane change. Rigs with the least crack-the-whip effect are shown at the top and those with the most, at the bottom. Rearward amplification of 2.0 in the chart means that the rear trailer is twice as likely to turn over as the tractor. You can see that triples have a rearward amplification of 3.5. This means you can roll the last trailer of triples 3.5 times as easily as a five-axle tractor-semi.



**Influence of Combination Type on rearward Amplification**  
 (from R.D. Ervin, R.L. Nisonger, C.C. MacAdam, and P.S. Fancher, "Influence of size and weight variables on the stability and control properties of heavy trucks", University of Michigan Transportation Research Institute, 1983.)

Steer gently and smoothly when you are pulling trailers. If you make a sudden movement with your steering wheel, your trailer could tip over. Follow far enough behind other vehicles (at least one second for each ten feet of your vehicle length, plus another second if going over 40 mph). Look far enough down the road to avoid being surprised and having to make a sudden lane change. At night, drive slowly enough to see obstacles with your headlights before it is too late to change lanes or stop gently. Slow down to a safe speed before going into a turn.

### Brake Early

Control your speed whether fully loaded or empty. Large combination vehicles take longer to stop when they are empty than when they are fully loaded. When lightly loaded, the very stiff suspension springs and strong brakes give poor traction and make it very easy to lock up the wheels. Your trailer can swing out and strike other vehicles. Your tractor can jackknife very quickly (Figure 6-2). You also must be very careful about driving "bobtail" tractors (tractors without semitrailers). Tests have shown that bobtails can be very hard to stop smoothly. It takes them longer to stop than a tractor-semitrailer loaded to maximum gross weight.

In any combination rig, allow lots of following distance and look far ahead, so you can brake early. Don't be caught by surprise and have to make a "panic" stop.

### Prevent Trailer Skids

When the wheels of a trailer lock up, the trailer will tend to swing around. This is more likely to happen

when the trailer is empty or lightly loaded. This type of jackknife is often called a "trailer jackknife." This is shown in Figure 6-3.

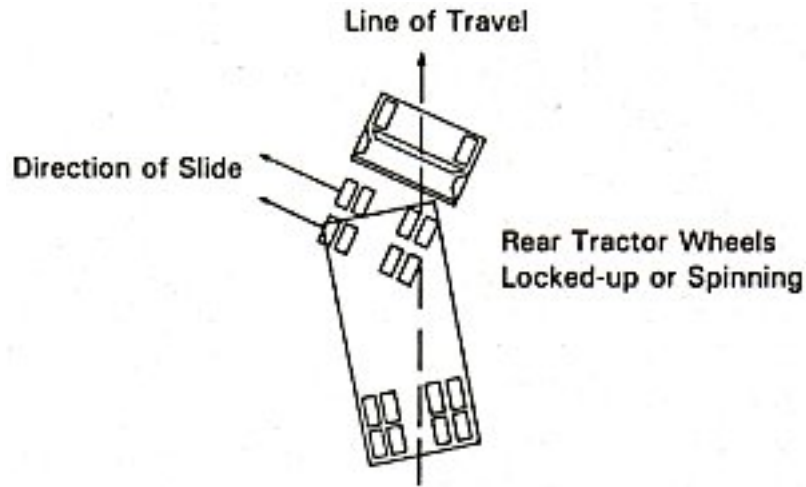
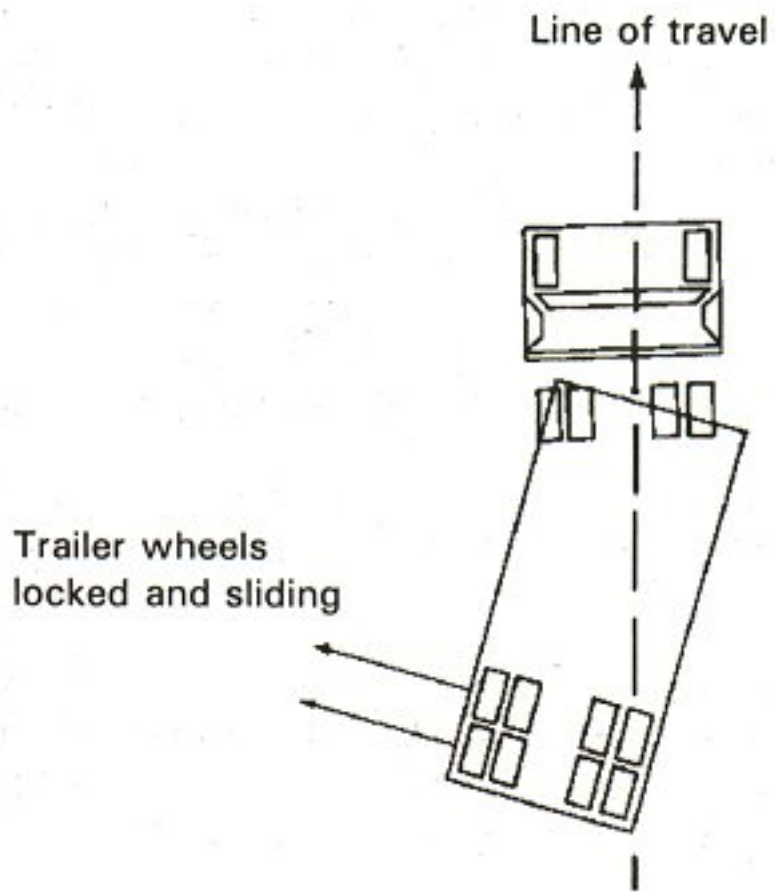


Figure 6-2 Tractor Jackknife

The procedure for stopping a trailer skid is as follows:

**Recognize the skid.** The earliest and best way to recognize that the trailer has started to skid is by seeing it in your mirrors. Any time you apply the brakes hard, check the mirrors to make sure the trailer is staying where it should be. Once the trailer swings out of your lane, it's very difficult to prevent a jackknife.

**Stop using the brake.** Release the brakes to get traction back. Do **not** use the trailer hand brake (if you have one) to "straighten out the rig." This is the wrong thing to do since the brakes on the trailer wheels caused the skid in the first place. Once the trailer wheels grip the road again, the trailer will start to



follow the tractor and straighten out.

Figure 6-3 Trailer Jackknife

## Turn Wide

When a vehicle goes around a corner, the rear wheels follow a different path than the front wheels. This is called **offtracking** or "cheating." Figure 6-4 shows how offtracking causes the path followed by a tractor-semi to be wider than the rig itself. Longer vehicles will offtrack more. The rear wheels of the powered unit (truck or tractor) will offtrack some, and the rear wheels of the trailer will offtrack even more. If there is more than one trailer, the rear wheels of the last trailer will offtrack the most. Steer the front end wide enough around a corner so the rear end does not run over the curb, pedestrians, other vehicles, etc. However, keep the rear of your vehicle close to the curb. This will stop other drivers from passing you on the right. If you cannot complete your turn without entering another traffic lane, turn wide as you complete the turn (Figure 6.5). This is better than swinging wide to the left before starting the turn because it will keep other drivers from passing you on the right. If drivers pass on the right, you

might collide with them when you turn.

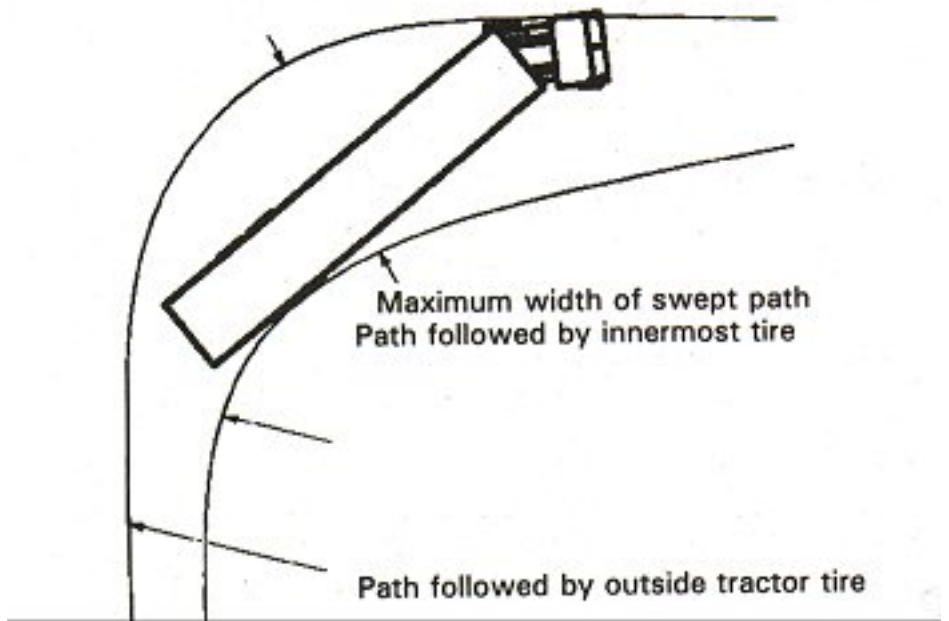


Figure 6-4 Offtracking in a 90-degree turn.



Figure 2-11  
Do This

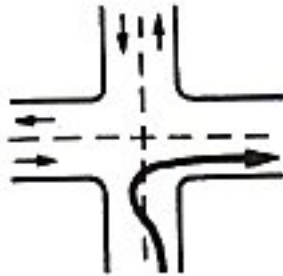


Figure 2-12  
Don't Do This

Figure 6-5  
Do this so cars don't try  
to pass you on the right.

Figure 6-5  
Don't do this!

### Test Your Knowledge

1. What two things are important to prevent a rollover?
2. When you turn suddenly while pulling doubles, which trailer is most likely to turn over?
3. Why should you not use the trailer hand brake to straighten out a jackknifing trailer?
4. What is offtracking?
5. Why should you turn like it shows in Figure 6-5?

*These questions may be on your test. If you can't answer them all, re-read Section 6.1.*

## 6.2 Combination Vehicle Air Brakes

You should study "[Section 5: Single Vehicle Air Brakes](#)" before reading this. In combination vehicles the braking system has parts to control the trailer brakes, in addition to the parts described in [Section 5](#). These parts are described below:

### Trailer Hand Valve

The trailer hand valve (also called the trolley valve or Johnson bar), works the trailer brakes. The trailer hand valve should be used only to test the trailer brakes. Do not use it in driving because of the danger of making the trailer skid. The foot brake sends air to **all** of the brakes on the vehicle (including the trailer(s)). There is much less danger of causing a skid or jackknife when using just the foot brake.

Never use the hand valve for parking because all the air might leak out unlocking the brakes (in trailers that don't have spring brakes). Always use the **parking brakes** when parking. If the trailer does not have spring brakes, use wheel chocks to keep the trailer from moving.

### Tractor Protection Valve

The tractor protection valve keeps air in the tractor or truck should, the trailer break away or develop a bad leak. The tractor protection valve is controlled by the "trailer air supply" control valve in the cab. The control valve allows you to open and shut the tractor protection valve. The tractor protection valve will close automatically if air pressure is low (in the range of 20 to 45 psi). When the tractor protection valve closes, it stops any air from going out of the tractor. It also lets the air out of the trailer emergency line. This causes the trailer emergency brakes to come on. (Emergency brakes are covered later.)

### Trailer Air Supply Control

The trailer air supply control on newer vehicles is a red 8-sided, knob which you use to control the tractor protection valve. You push it in to supply the trailer with air, and pull it out to shut the air off and put on the trailer emergency brakes. The valve will pop out (thus closing the tractor protection valve) when the air pressure drops into the range of 20 to 45 psi. Tractor protection valve controls or "emergency" valves on older vehicles may not operate automatically. There may be a lever rather than a knob. The "normal" position is used for pulling a trailer. The "emergency" position is used to shut the air off and put on the trailer emergency brakes.

### Trailer Air Lines

Every combination vehicle has two air lines, the **service** line and the **emergency** line. They run between each vehicle (tractor to trailer, trailer to dolly, dolly to second trailer, etc.)

**Service Air Line.** The **service** line (also called the control line or signal line) carries air which is controlled by the foot brake or the trailer hand brake. Depending on how hard you press the foot brake or hand valve, the pressure in the service line will similarly change. The service line is connected to **relay valves**. These valves allow the trailer brakes to be applied more quickly than would otherwise be possible.

**Emergency Air Line.** The emergency line (also called the supply line) has two purposes. First, it supplies air to the trailer air tanks. Second, the emergency line controls the emergency brakes on



combination vehicles. **Loss of air pressure** in the emergency line causes the trailer emergency brakes to come on. The pressure loss could be caused by a trailer breaking loose, thus tearing apart the emergency air hose. Or it could be caused by a hose, metal tubing, or other part which breaks, letting the air out. When the emergency line loses pressure, it also causes the tractor protection valve to close (the air supply knob will pop out).

Emergency lines are often coded with the color **red** (red hose, red couplers, or other parts) to keep from getting them mixed up with the blue service line.

### **Hose Couplers (Glad Hands)**

Glad hands are coupling devices used to connect the service and emergency air lines from the truck or tractor to the trailer. The couplers have a rubber seal which prevents air from escaping. Clean the couplers and rubber seals before a connection is made. When connecting the glad hands, press the two seals together with the couplers at a 90 degree angle to each other. A turn of the glad hand attached to the hose will join and lock the couplers.

Some vehicles have "dead end" or dummy couplers to which the hoses may be attached when they are not in use. This will prevent water and dirt from getting into the coupler and the air lines. Use the dummy couplers when the air lines are not connected to a trailer. If there are no dummy couplers, the glad hands can sometimes be locked together (depending on the couplings). It is very important to keep the air supply clean.

When coupling, make sure to couple the proper glad hands together. To help avoid mistakes, colors are sometimes used. Blue is used for the service lines and red for the emergency (supply) lines. Sometimes, metal tags are attached to the lines with the words "service" and "emergency" stamped on them.

If you do cross the air lines, supply air will be sent to the service line instead of going to charge the trailer air tanks. Air will not be available to release the trailer spring brakes (parking brakes). If the spring brakes don't release when you push the trailer air supply control, check the air line connections.

Older trailers do not have spring brakes. If the air supply in the trailer air tank has leaked away there will be no emergency brakes, and the trailer wheels will turn freely. If you crossed the air lines, you could drive away but you wouldn't have trailer brakes. **This would be very dangerous.** Always test the trailer brakes before driving with the hand valve or by pulling the air supply (tractor protection valve) control. Pull gently against them in a low gear to make sure the brakes work.

### **Trailer Air Tanks**

Each trailer and converter dolly has one or more air tanks. They are filled by the **emergency (supply) line** from the tractor. They provide the air pressure used to operate trailer brakes. Air pressure is sent from the air tanks to the brakes by relay valves. The pressure in the **service line tells** how much pressure the relay valves should send to the trailer brakes. The pressure in the service line is controlled by the brake pedal (and the trailer hand brake).

It is important that you don't let water and oil build up in the air tanks. If you do, the brakes may not work correctly. Each tank has a drain valve on it and you should drain each tank every day. If your tanks have automatic drains, they will keep most moisture out. But you should still open the drains to make sure.

## Shut-Off Valves

Shut-off valves (also called cut-out cocks) are used in the service and supply air lines at the back of trailers used to tow other trailers. These valves permit closing the air lines off when another trailer is not being towed. You must check that all shut-off valves are in the **open** position except the ones at the back of the last trailer, which must be **closed**.

## Trailer Service, Parking, and Emergency Brakes

Newer trailers have spring brakes just like trucks and truck tractors. However, converter dollies and trailers built before 1975 are not required to have spring brakes. Those that do not have spring brakes have emergency brakes which work from the air stored in the trailer air tank. The emergency brakes come on whenever air pressure in the emergency line is lost. **These trailers have no parking brake.** The emergency brakes come on whenever the air supply knob is pulled out or the trailer is disconnected. But the brakes will hold only as long as there is air pressure in the trailer air tank. Eventually, the air will leak away and then there will be no brakes. Therefore, **it is very important for safety that you use wheel chocks when you park trailers without spring brakes.**

A major leak in the **emergency** line will cause the tractor protection valve to close and the trailer emergency brakes to come on.

You may not notice a major leak in the **service** line until you try to put the brakes on. Then, the air loss from the leak will lower the air tank pressure quickly. If it goes low enough, the trailer emergency brakes will come on.

## Test Your Knowledge

1. Why should you not use the trailer hand valve while driving?
2. Describe what the trailer air supply control does.
3. Describe what the service line is for.
4. What is the emergency air line for?
5. Why should you use chocks when parking a trailer without spring brakes?
6. Where are shut-off valves?

*These questions may be on your test. If you can't answer them all, re-read Section 6.2.*

## 6.3 Coupling and Uncoupling

Knowing how to couple and uncouple correctly is basic to safe operation of combination vehicles. Wrong coupling and uncoupling can be very dangerous. General coupling and uncoupling steps are listed below. There are differences between different rigs, so learn the details of coupling and uncoupling the truck(s) you will operate.

### Coupling Tractor-Semitrailers

#### Step 1. Inspect Fifth Wheel

- Check for damaged/missing parts.
- Check to see that mounting to tractor is secure, no cracks in frame, etc.

- Be sure that the fifth wheel plate is greased as required. Failure to keep the fifth wheel plate lubricated could cause steering problems because of friction between the tractor and trailer.
- Check if fifth wheel is in proper position for coupling.
  - Wheel tilted down towards rear of tractor.
  - Jaws open.
  - Safety unlocking handle in the automatic lock position.
- If you have a sliding fifth wheel, make sure it is locked.
- Make sure the trailer kingpin is not bent or broken.

## **Step 2. Inspect Area and Chock Wheels**

- Make sure area around the vehicle is clear.
- Be sure trailer wheels are chocked or spring brakes are on.
- Check that cargo (if any) is secured against movement due to tractor being coupled to the trailer.

## **Step 3. Position Tractor**

- Put the tractor directly in front of the trailer. (Never back under the trailer at an angle because you might push the trailer sideways and break the landing gear.)
- Check position, using outside mirrors, by looking down both sides of the trailer.

## **Step 4. Back Slowly**

- Back until fifth wheel just touches the trailer.
- Don't hit the trailer.

## **Step 5. Secure Tractor**

- Put on the parking brake.
- Put transmission in neutral.

## **Step 6. Check Trailer Height**

- The trailer should be low enough that it is raised slightly by the tractor when the tractor is backed under it. Raise or lower the trailer as needed. (If the trailer is too low, the tractor may strike and damage nose of the trailer; if the trailer is too high, **it may not couple correctly.**)
- Check that the kingpin and fifth wheel are aligned.

## **Step 7. Connect Air Lines to Trailer**

- Check glad hand seals and connect tractor emergency air line to trailer emergency glad hand.
- Check glad hand seals and connect tractor service air line to trailer service glad hand.
- Make sure air lines are safely supported where they won't be crushed or caught while tractor is backing under the trailer.

## **Step 8. Supply Air to Trailer**

- From cab, push in "air supply" knob or move tractor protection valve control from the "emergency" to the "normal" position to supply air to the trailer brake system.
- Wait until the air pressure is normal.

- Check brake system for crossed air lines.

--Shut engine off so you can hear the brakes.

--Apply and release trailer brakes and listen for sound of trailer brakes being applied and released. You should hear the brakes move when applied and air escape when the brakes are released.

--Check air brake system pressure gauge for signs of major air loss.

- When you are sure trailer brakes are working, start engine.
- Make sure air pressure is up to normal.

### Step 9. Lock Trailer Brakes

- Pull out the "air supply" knob or move the tractor protection valve control from "normal" to "emergency."

### Step 10. Back Under Trailer

- Use lowest reverse gear.
- Back tractor slowly under trailer to avoid hitting the kingpin too hard.
- Stop when the kingpin is locked into the fifth wheel.

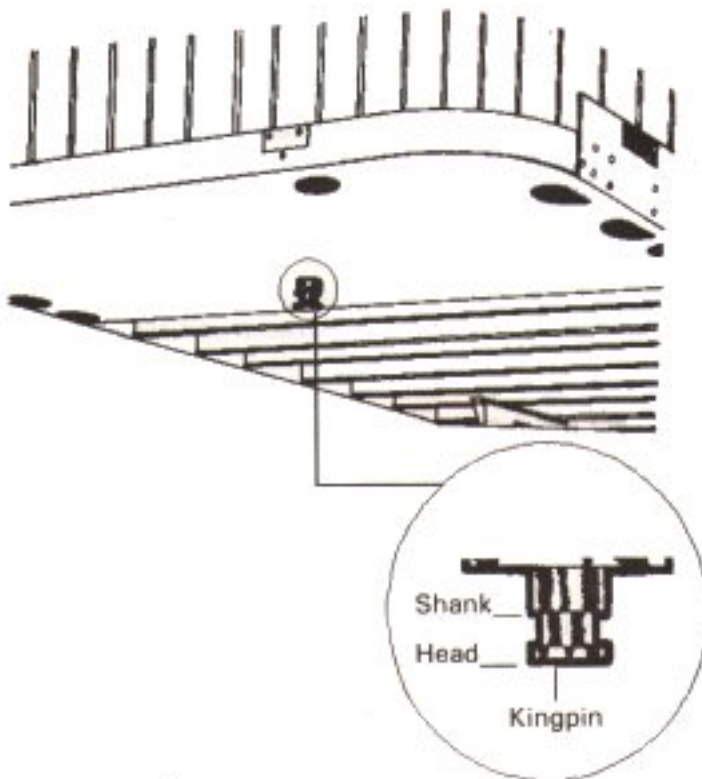


Figure 6-7 Trailer Kingpin

### Step 11. Check Connection for Security

- Raise trailer landing gear **slightly** off ground.
- Pull tractor **gently** forward while the trailer brakes are still locked to check that the trailer is locked onto the tractor.

### Step 12. Secure Vehicle

- Put transmission in neutral.
- Put parking brakes on.
- Shut off engine and **take key with you so someone else won't move truck while you are under it.**

### Step 13. Inspect Coupling

- Use a flashlight, if necessary.
- Make sure there is **no space between upper and lower fifth wheel**. If there is space, something is wrong (kingpin may be on **top** of closed fifth wheel jaws; trailer would come loose very easily).
- Go under trailer and look into the back of the fifth wheel. Make sure the fifth wheel jaws have closed around the shank of the kingpin (see Figure 6-7).
- Check that the locking lever is in the "lock" position.
- Check that the safety latch is in position over locking lever. (On some fifth wheels the catch must be put in place by hand.)
- If the coupling isn't right, **don't drive the coupled unit**; get it fixed.

### Step 14. Connect the Electrical Cord and Check Air Lines

- Plug the electrical cord into the trailer and fasten the safety catch.
- Check both air lines and electrical line for signs of damage.
- Make sure air and electrical lines will not hit any moving parts of vehicle.

### Step 15. Raise Front Trailer Supports (Landing Gear)

- Use low gear range (if so equipped) to begin raising the landing gear. Once free of weight, switch to the high gear range.
- Raise the landing gear all the way up. (Never drive with landing gear only part way up as it may catch on railroad tracks or other things.)
- After raising landing gear, secure the crank handle safely.
- When full weight of trailer is resting on tractor;
  - Check for enough clearance between rear of tractor frame and landing gear. (When tractor turns sharply, it must not hit landing gear.
  - Check that there is enough clearance between the top of the tractor tires and the nose of the trailer.

### Step 16. Remove Trailer Wheel Chocks

- Remove and store wheel chocks in a safe place.

### Uncoupling Tractor-Semi-trailer

The following steps will help you to uncouple safely:

#### Step 1. Position Rig

- Make sure surface of parking area can support weight of trailer.
- Have tractor lined up with the trailer. (Pulling out at an angle can damage landing gear.)

## **Step 2. Ease Pressure on Locking Jaws**

- Shut off trailer air supply to lock trailer brakes.
- Ease pressure on fifth wheel locking jaws by backing up gently. (This will help you release the fifth wheel locking lever.)
- Put parking brakes on while tractor is pushing against the kingpin. (This will hold rig with pressure off the locking jaws.)

## **Step 3. Chock Trailer Wheels**

- Chock the trailer wheels if the trailer doesn't have spring brakes or if you're not sure. (The air could leak out of the trailer air tank, releasing its emergency brakes. Without chocks, the trailer could move.)

## **Step 4. Lower The Landing Gear**

- If trailer is empty--lower the landing gear until it makes firm contact with the ground.
- If trailer is loaded, after the landing gear makes firm contact with the ground, turn crank in low gear a few extra turns. This will lift some weight off the tractor. (Do not lift trailer off the fifth wheel.) This will:
  - make it easier to unlatch fifth wheel;
  - make it easier to couple next time.

## **Step 5. Disconnect Air Lines and Electrical Cable**

- Disconnect air lines from trailer. Connect air line glad hands to dummy couplers at back of cab or couple them together.
- Hang electrical cable with plug down to prevent moisture from entering it.
- Make sure lines are supported so they won't be damaged while driving the tractor.

## **Step 6. Unlock Fifth Wheel**

- Raise the release handle lock.
- Pull the release handle to "open" position.
- Keep legs and feet clear of the rear tractor wheels to avoid serious injury in case the vehicle moves.

## **Step 7. Pull Tractor Partially Clear of Trailer**

- Pull tractor forward until fifth wheel comes out from under the trailer.
- Stop with tractor frame under trailer (prevents trailer from falling to ground if landing gear should collapse or sink).

## **Step 8. Secure Tractor**

- Apply parking brake.
- Place transmission in neutral.

## **Step 9. Inspect Trailer Supports**

- Make sure ground is supporting trailer.



- Make sure landing gear is not damaged.

## **Step 10. Pull Tractor Clear of Trailer**

- Release parking brakes.
- Check the area and drive tractor forward until it clears.

## **Test Your Knowledge**

1. What might happen if the trailer is too high when you try to couple?
2. After coupling, how much space should be between the upper and lower fifth wheel?
3. You should look into the back of the fifth wheel to see if it is locked onto the kingpin. True or False.
4. To drive you need to raise the landing gear only until it just lifts off the pavement. True or False?
5. What is a converter dolly?

*These questions may be on your test. If you can't answer them all, re-read Section 6.3.*

## **6.4 Inspecting a Combination Vehicle**

Use the seven-step inspection procedure described in Section 2 to inspect your combination vehicle. There are more things to inspect on a combination vehicle than on a single vehicle. (For example, tires, wheels, lights, reflectors, etc.) However, there are also some new things to check. These are discussed below.

Do these checks in addition to those already listed in Section 2, "Step 5: Do Walkaround Inspection."

### **Additional Things to Check During a Walk Around Inspection**

#### **Coupling System Areas**

- Check fifth wheel (lower).
  - Securely mounted to frame.
  - No missing, damaged parts.
  - Enough grease.
  - No visible space between upper and lower fifth wheel.
  - Locking jaws around the shank, not the head of kingpin.
  - Release arm properly seated and safety latch/lock engaged.
- Fifth wheel (upper).
  - Glide plate securely mounted to trailer frame.
  - Kingpin not damaged.
- Air and electric lines to trailer.
  - Electrical cord firmly plugged in and secured.
  - Air lines properly connected to glad hands, no air leaks, properly secured with enough slack for turns.

- All lines free from damage.
- Sliding fifth wheel.
  - Slide not damaged or parts missing.
  - Properly greased.
  - All locking pins present and locked in place.
  - If air powered -- no air leaks.
  - Check that fifth wheel is not so far forward that tractor frame will hit landing gear or the cab hit the trailer, during turns.

## **Landing Gear**

- Fully raised, no missing parts, not bent or otherwise damaged.
- Crank handle in place and secured.
- If power operated, no air or hydraulic leaks.

## **Combination Vehicle Brake Check**

Do these checks in **addition** to Section 5.3, Inspecting Air Brake Systems.

The following section explains how to check air brakes on combination vehicles. Check the brakes on a double or triple trailer as you would any combination vehicle.

**Check that Air Flows to All Trailers.** Use the tractor parking brake and/or chock the wheels to hold the vehicle. Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines. Use the trailer handbrake to provide air to the service line. Go to the rear of the rig. Open the emergency line shut-off valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged. Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers (this test assumes that the trailer handbrake or the service brake pedal is on), then close the valve. If you do NOT hear air escaping from both lines, check that the shut-off valves on the trailer(s) and dolly (s) are in the OPEN position. You MUST have air all the way to the back for all the brakes to work.

**Test Tractor Protection, Valve.** Charge the trailer air brake system. (That is, build up normal air pressure and push the "air supply" knob in). Shut the engine off. Step on and off the brake pedal several times to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. (Usually within the range of 20 to 45 psi.)

If the tractor protection valve doesn't work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

**Test Trailer Emergency Brakes.** Charge the trailer air brake system and check that the trailer rolls freely. Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve) or place it in the "emergency" position. Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

**Test Trailer Service Brakes.** Check for normal air pressure, release the parking brakes, move the

vehicle forward slowly, and apply trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes come on. This tells you the trailer brakes are connected and working. (The trailer brakes should be tested with the hand valve but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.)

### **Test Your Knowledge**

1. Which shut-off valves should be open and which closed?
2. How can you test that air flows to all trailers?
3. How can you test the tractor protection valve?
4. How can you test the trailer emergency brakes?
5. How can you test the trailer service brakes?

*These questions may be on your test. If you can't answer them all, re-read Section 6.4.*

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# Section 7: Doubles and Triples

This section has information you need to pass the CDL knowledge test for driving safely with double and triple trailers. It tells about how important it is to be very careful when driving with more than one trailer, how to couple and uncouple correctly, and of inspecting doubles and triples carefully (You should also study Sections [2](#), [5](#) and [6](#).)

## 7.1 Pulling Double/Triple Trailers

Take special care when pulling two and three trailers. There are more things that can go wrong, and doubles/triples are less stable than other commercial vehicles. Some areas of concern are discussed below.

### Prevent Trailers From Rolling Over

To prevent trailers from rolling over, you must steer gently and go slowly around corners, on-ramps, off-ramps, and curves. A safe speed on a curve for a straight truck or a single trailer combination vehicle may be too fast for a set of doubles or triples.

### Beware of the Crack-The-Whip Effect

Doubles and triples are more likely to turn over than other combination vehicles because of the "crack-the-whip" effect. You must steer gently when pulling trailers. The last trailer in a combination is most likely to turn over. If you don't understand the crack-the-whip effect, study [Section 6.1](#) and review figure 6-1 in the Combination Vehicles section of this manual.

### Inspect Completely

There are more critical parts to check when you have two or three trailers. Check them all. Follow the procedures described later in this section.

### Look Far Ahead

Doubles and triples must be driven very smoothly to avoid rollover or jackknife. Therefore, **look far ahead** so you can slow down or change lanes gradually when necessary.

### Manage Space

Doubles and triples take up more space than other commercial vehicles. They are not only longer, but also need more space because they can't be turned or stopped suddenly. Allow more following distance. Make sure you have large enough gaps before entering or crossing traffic. Be certain you are clear at the sides before changing lanes.

### Adverse Conditions

Be more careful in adverse conditions. In bad weather, slippery conditions, and mountain driving, you must be especially careful if you drive double and triple bottoms. You will have greater length and more dead axles to pull with your drive axles than other drivers. There is more chance for skids and loss of traction.

## 7.2 Coupling and Uncoupling

Knowing how to couple and uncouple correctly is basic to safe operation of doubles and triples. Wrong coupling and uncoupling can be very dangerous. Coupling and uncoupling steps for doubles and triples are listed below:

### Coupling Twin Trailers

#### Secure Second (Rear) Trailer

- If the second trailer doesn't have spring brakes, drive the tractor close to the trailer, connect the emergency line, charge the trailer air tank, and disconnect the emergency line. This will set the trailer emergency brakes (if the slack adjusters are correctly adjusted). Chock the wheels if you have any doubt about the brakes.

#### Couple Tractor and First Semi-trailer as Described Earlier.

Caution: For the safest handling on the road, the more heavily loaded semi-trailer should be in first position behind the tractor. The lighter trailer should be in the rear.

A converter gear or dolly is a coupling device of one or two axles and a fifth wheel by which a semi-trailer can be coupled to the rear of a tractor-trailer combination forming a double bottom rig.

#### Position Converter Dolly in Front of Second (Rear) Trailer

- Release dolly brakes by opening the air tank petcock. (Or, if the dolly has spring brakes, use the dolly parking brake control.)
- If the distance is not too great, wheel dolly into position by hand so it is in line with the kingpin.
- Or, use the tractor and first semi-trailer to pick up the converter dolly:
  - Position combination as close as possible to converter dolly.
  - Move dolly to rear of first semi-trailer and couple it to the trailer.
  - Lock pintle hook.
  - Secure dolly support in raised position.
  - Pull dolly into position as close as possible to nose of the second semi-trailer.
  - Lower dolly support.
  - Unhook dolly from first trailer.
  - Wheel dolly into position in front of second trailer in line with the kingpin.

#### Connect Converter Dolly to Front Trailer

- Back first semi-trailer into position in front of dolly tongue.
- Hook dolly to front trailer.
  - Lock pintle hook.
  - Secure converter gear support in raised position.

#### Connect Converter Dolly to Rear Trailer

- Make sure trailer brakes are locked and/or wheels chocked.

- Make sure trailer height is correct. (It must be slightly lower than the center of the fifth wheel, so trailer is raised slightly when dolly is pushed under.)
- Back converter dolly under rear trailer.
- Raise landing gear slightly off ground to prevent damage if trailer moves.
- Test coupling by pulling against pin of number two semi-trailer.
- Make visual check of coupling. (No space between upper and lower fifth wheel. Locking jaws closed on kingpin.)
- Connect safety chains, air hoses, and light cords.
- Close converter dolly air tank petcock and shut-off valves at rear of second trailer (service and emergency shut-offs).
- Open shut-off valves at rear of first trailer (and on dolly if so equipped).
- Raise landing gear completely.
- Charge trailers (push "air supply" knob in) and check for air at rear of second trailer by opening the emergency line shut-off. If air pressure isn't there, something is wrong and the brakes won't work.

## **Uncoupling Twin Trailers**

### **Uncouple Rear Trailer**

- Park rig in a straight line on firm level ground.
- Apply parking brakes so rig won't move.
- Chock wheels of second trailer if it doesn't have spring brakes.
- Lower landing gear of second semi-trailer enough to remove some weight from dolly.
- Close air shut-offs at rear of first semi-trailer (and on dolly if so equipped).
- Disconnect all dolly air and electric lines and secure them.
- Release dolly brakes.
- Release converter dolly fifth wheel latch.
- Slowly pull tractor, first semi-trailer, and dolly forward to pull dolly out from under rear semi-trailer.

### **Uncouple Converter Dolly**

- Lower dolly landing gear.
- Disconnect safety chains.
- Apply converter gear spring brakes or chock wheels.
- Release pintle hook on first semi-trailer.
- Slowly pull clear of dolly.

**Caution:** Never unlock the pintle hook with the dolly still under the rear trailer. The dolly tow bar may fly up, possibly causing injury, and making it very difficult to re-couple.

## **Coupling & Uncoupling Triple Trailers**



## **Couple Second and Third Trailers**

- Couple second and third trailers using the method for coupling doubles.
- Uncouple tractor and pull away from second and third trailers.

## **Couple Tractor/First Semi-trailer to Second/Third Trailers**

- Couple tractor to first trailer. Use the method already described for coupling tractor-semitrailers.
- Move converter dolly into position and couple first trailer to second trailer using the method for coupling doubles. Triples rig is now complete.

## **Uncouple Triple-Trailer Rig**

- Uncouple third trailer by pulling the dolly out, then unhitching the dolly using the method for uncoupling doubles.
- Uncouple remainder of rig as you would any double-bottom rig using the method already described.

## **Coupling & Uncoupling Other Combinations**

The methods described so far apply to the more common tractor-trailer combinations. However, there are other ways of coupling and uncoupling the many types of truck-trailer and tractor-trailer combinations that are in use. There are too many to cover in this manual. Learn the right way to couple the vehicle(s) you will drive according to the manufacturer and/or owner.

## **7.3 Inspecting Doubles and Triples**

Use the seven-step inspection procedure described in [Section 2](#) to inspect your combination vehicle. There are more things to inspect on a combination vehicle than on a single vehicle. Many of these items are simply more of what you would find on a single vehicle. (For example, tires, wheels, lights, reflectors, etc.) However, there are also some new things to check. These are discussed below.

### **Additional Things To Check During a Walk-around Inspection**

Do these checks in addition to those already listed in [Section 2](#), "Step 5: Do Walkaround Inspection."

### **Coupling System Areas**

- Check fifth wheel (lower).
  - Securely mounted to frame.
  - No missing, damaged parts.
  - Enough grease.
  - No visible space between upper and lower fifth wheel.
  - Locking jaws around the shank, not the head of kingpin.
  - Release arm properly seated and safety latch/lock engaged.
- Fifth wheel (upper).
  - Glide plate securely mounted to trailer frame.
  - Kingpin not damaged.

- Air and electric lines to trailer.
  - Electrical cord firmly plugged in and secured.
  - Air lines properly connected to glad hands, no air leaks, properly secured with enough slack for turns.
  - All lines free from damage.
- Sliding fifth wheel.
  - Slide not damaged or parts missing.
  - Properly greased.
  - All locking pins present and locked in place.
  - If air powered -- no air leaks.
  - Check that fifth wheel is not so far forward that tractor frame will hit landing gear, or cab hit the trailer, during turns.

## **Landing Gear**

- Fully raised, no missing parts, not bent or otherwise damaged.
- Crank handle in place and secured.
- If power operated, no air or hydraulic leaks.

## **Double and Triple Trailers**

- Shut-off valves (at rear of trailers, in service and emergency lines):
  - Rear of front trailers: OPEN.
  - Rear of last trailer: CLOSED.
  - Converter dolly air tank drain valve: CLOSED.
- Be sure air lines are supported and glad hands are properly connected.
- If spare tire is carried on converter gear (dolly), make sure it's secured.
- Be sure pintle-eye of dolly is in place in pintle hook of trailer(s).
- Make sure pintle hook is latched.
- Safety chains should be secured to trailer(s).
- Be sure light cords are firmly in sockets on trailers.

Do these checks in **addition** to [Section 5.3, "Inspecting Air Brake Systems."](#)

## **7.4 Doubles/Triples Air Brake Check**

Check the brakes on a double or triple trailer as you would any combination vehicle. [Section 6.2](#) explains how to check air brakes on combination vehicles. You must also make the following checks on your double or triple trailers:

### **Check That Air Flows to All Trailers (Double and Triple Trailers)**

Use the tractor. parking brake and/or chock the wheels to hold the vehicle. Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines. Use the trailer handbrake to provide air to the service line. Go to the rear of the rig. Open the

emergency line shut-off valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged. Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers (this test assumes that the trailer handbrake or the service brake pedal is on), then close the valve. If you do NOT hear air escaping from both lines, check that the shut-off valves on the trailer(s) and dolly (s) are in the OPEN position. You MUST have air all the way to the back for all the brakes to work.

### **Test Tractor Protection Valve**

Charge the trailer air brake system. (That is, build up normal air pressure and push the "air supply" knob in.) Shut the engine off. Step on and off the brake pedal several times to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. (Usually within the range of 20 to 45 psi.)

If the tractor protection valve doesn't work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

### **Test Trailer Emergency Brakes**

Charge the trailer air brake system and check that the trailer rolls freely. Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve) or place it in the "emergency" position. Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

### **Test Trailer Service Brakes**

Check for normal air pressure, release the parking brakes, move the vehicle forward slowly, and apply trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes come on. This tells you the trailer brakes are connected and working. (The trailer brakes should be tested with the hand valve, but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.)

### **Test Your Knowledge**

1. What is a converter dolly?
2. Do converter dollies have spring brakes?
3. What three methods can you use to secure a second trailer before coupling?
4. How do you check to make sure trailer height is correct before coupling?
5. What do you check when making a visual check of coupling?
6. Why should you pull a dolly out from under a trailer before you disconnect it from the trailer in front?
7. What should you check for when inspecting the converter dolly? The pintle hook?
8. Should the shut-off valves on the rear of the last trailer be open or closed? On the first trailer in a set of doubles? On the middle trailer of a set of triples?
9. How can you test that air flows to all trailers?

*These questions may be on your test. If you can't answer them all, re-read [Sections 7.1, 7.2, 7.3 and 7.4.](#)*

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[Previous](#) [Next](#)

# Section 8: Tank Vehicles

This section has information needed to pass the CDL knowledge test for driving a tank vehicle. (You should also study [Sections 2, 5, and 6](#)). A "tank vehicle" is used to carry any liquid or liquid gas in a tank of 1000 gallons or more.

Before loading, unloading, or driving a tanker, inspect the vehicle. This makes sure that the vehicle is safe to carry the liquid or gas and is safe to drive.

## 8.1 Inspecting Tank Vehicles

Tank vehicles have special items that you need to check. Tank vehicles come in many types and sizes. You need to check the vehicle's operator's manual to make sure you know how to inspect your tank vehicle.

### Leaks

On all tank vehicles, the most important item to check for is leaks. Check under and around the vehicle for signs of any leaking. Don't carry liquids or gases in a leaking tank. In general, check the following:

- Check the tank's body or shell for dents or leaks.
- Check the intake, discharge, and cut-off valves. Make sure the valves are in the correct position before loading, unloading, or moving the vehicle.
- Check pipes, connections, and hoses for leaks, especially around joints.
- Check manhole covers and vents. Make sure the covers have gaskets and they close correctly. Keep the vents clear so they work correctly.
- Check special purpose equipment. If your vehicle has any of the following equipment, make sure it works:
  - Vapor recovery kits.
  - Grounding and bonding cables.
  - Emergency shut-off systems.
  - Built in fire extinguisher.

Make sure you know how to operate your special equipment.

- Check the emergency equipment required for your vehicle. Find out what equipment you're required to carry and make sure you have it (and it works).

## 8.2 Driving Tank Vehicles

Hauling liquids in tanks requires special skills because of the high center of gravity and liquid movement.

### High Center Of Gravity

High center of gravity means that much of the load's weight is carried high up off the road. This makes the vehicle top-heavy and easy to roll over. Liquid tankers are especially easy to roll over. Tests have

shown that tankers can turn over at the speed limits posted for curves. Take highway curves and on-ramp/off-ramp curves well below the posted speeds.

## **Danger of Surge**

Liquid surge results from movement of the liquid in partially filled tanks. This movement can have bad effects on handling. For example, when coming to a stop, the liquid will surge back and forth. When the wave hits the end of the tank, it tends to push the truck in the direction the wave is moving. If the truck is on a slippery surface such as ice, the wave can shove a stopped truck out into an intersection. The driver of a liquid tanker must be very familiar with the handling of the vehicle.

## **Bulkheads**

Some liquid tanks are divided into several smaller tanks by bulkheads. When loading and unloading the smaller tanks, the driver must pay attention to weight distribution. Don't put too much weight on the front or rear of the vehicle.

## **Baffled Tanks**

Baffled liquid tanks have bulkheads in them with holes that let the liquid flow through. The baffles help to control the forward and backward liquid surge. Side-to-side surge can still occur. This can cause a roll over.

## **Un-baffled Tanks**

Un-baffled liquid tankers (sometimes called "smooth bore" tanks) have nothing inside to slow down the flow of the liquid. Therefore, forward-and-back surge is very strong. Un-baffled tanks are usually those that transport food products (milk, for example). (Sanitation regulations forbid the use of baffles because of the difficulty in cleaning the inside of the tank.) Be extremely cautious (slow and careful) in driving smooth bore tanks, especially when starting and stopping.

## **Outage**

Never load a cargo tank totally full. Liquids expand as they warm and you must leave room for the expanding liquid. This is called "outage." Since different liquids expand by different amounts, they require different amounts of outage. You must know the outage requirement when hauling liquids in bulk.

## **How Much To Load?**

A full tank of dense liquid (such as some acids) may exceed legal weight limits. For that reason, you may often only partially fill tanks with heavy liquids. The amount of liquid to load into a tank depends on:

- The amount the liquid will expand in transit.
- The weight of the liquid.
- Legal weight limits.



## 8.3 Safe Driving Rules

In order to drive tank vehicles safely, you must remember to follow all the safe driving rules. A few of these rules are:

### Drive Smoothly

Because of the high center of gravity and the surge of the liquid, you must start, slow down, and stop very smoothly. Also, make smooth turns and lane changes.

### Braking

If you must make a quick stop to avoid a crash, use controlled or stab braking. If you do not remember how to stop using these methods, review [Section 2.13](#). Also, remember that if you steer quickly while braking, your vehicle may roll over.

### Curves

Slow down before curves, then accelerate slightly through the curve. The posted speed for a curve may be too fast for a tank vehicle.

### Stopping Distance

Keep in mind how much space you need to stop your vehicle. Remember that wet roads double the normal stopping distance. Empty tank vehicles may take longer to stop than full ones.

### Skids

Don't over steer, over accelerate, or over brake. If you do, your vehicle may skid. On tank trailers, if your drive wheels or trailer wheels begin to skid, your vehicle may jackknife. When any vehicle starts to skid, you must take action to restore traction to the wheels.

### Test Your Knowledge

1. How are **bulkheads** different than **baffles**?
2. Should a tank vehicle take curves, on-ramps, or off-ramps at the posted speed limits?
3. How are smooth bore tankers different to drive than those with baffles?
4. What three things determine how much liquid you can load?
5. What is outage?
6. What two reasons make special care necessary when driving tank vehicles?

*These questions may be on the test. If you can't answer them all, re-read [Section 8.2](#).*

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# Section 9: Hazardous Materials

[Table A Radioactive Separation Table](#) [Table B Table of Hazard Class Definitions](#) [Glossary](#)

Hazardous materials are products that pose a risk to health, safety, and property during transportation. The term often is shortened to HAZMAT, which you may see on road signs, or to HM in government regulations. Hazardous materials include explosives, various types of gas, solids, flammable and combustible liquid, and other materials. Because of the risks involved and the potential consequences these risks impose, the handling of hazardous materials is very heavily regulated by all levels of government.

The Hazardous Materials Regulations (HMR) are found in parts 171-180 of title 49 of the Code of Federal Regulations. The common reference for these regulations is 49 CFR 171-180.

The Hazardous Materials Table in these regulations contains a list of these items. However, this list is not all-inclusive. Whether or not a material is considered hazardous is based on its characteristics and the shipper's decision on whether or not the material meets a definition of a hazardous material in the regulations.

The regulations require vehicles transporting certain types or quantities of hazardous materials to display diamond-shaped, square-on-point, warning signs called placards.

This section is designed to assist you in understanding your role and responsibilities in hauling hazardous materials. Due to the constantly changing nature of government regulations, it is impossible to guarantee absolute accuracy of the materials in this section. An up-to-date copy of the complete regulations is essential for you to have. Included in these regulations is a complete glossary of terms.

You must have a commercial driver's license (CDL) with a hazardous materials endorsement before driving vehicles carrying hazardous materials which require placards. You must pass a written test about the regulations and requirements to get this endorsement.

Everything you need to know to pass the written test is in this section. However, this is only a beginning. Most drivers need to know much more on the job. You can learn more by reading and understanding the federal and state rules applicable to hazardous materials as well as attending hazardous materials training courses. These courses are usually offered by your employer, colleges and universities, and various associations. You get copies of the Federal Regulations (49 CFR) through your local Government Printing Office bookstore and various industry publishers. Union or company offices often have copies of the rules for driver use. Find out where you can get your own copy to use on the job.

The regulations require training and testing for all drivers involved in transporting hazardous materials. Your employer or a designated representative is required to provide this training and testing. Hazardous materials employers are required to keep a record of that training on each employee as long as that employee is working with hazardous materials, and for 90 days thereafter. The regulations require that hazardous materials employees be trained and tested at least once every two years.

The regulations also require that drivers have special training before driving a vehicle transporting certain flammable gas materials or highway route controlled quantities of radioactive materials. In addition, drivers transporting cargo tanks and portable tanks must receive specialized training. Each

driver's employer or their designated representative must provide such training.

Some locations require permits to transport certain explosives or bulk hazardous wastes. States and counties also may require drivers to follow special hazardous materials routes. The federal government may require permits or exemptions for special hazardous materials cargo such as rocket fuel. Find out about permits, exemptions, and special routes for places you drive.

## 9.1 The Intent of the Regulations

Transporting hazardous materials can be risky. The regulations are intended to protect you, those around you, and the environment.

### Contain the Material

They tell shippers how to package the materials safely and drivers how to load, transport, and unload the material. These are called "containment rules."

### Communicate the Risk

To communicate the risk, shippers must warn drivers and others about the material's hazards. The regulations require shippers to put hazard warning labels on packages, provide proper shipping papers, emergency response information, and placards. These steps communicate the hazard to the shipper, the carrier, and the driver.

### Assure Safe Drivers and Equipment

In order to get a hazardous materials endorsement on a CDL, you must pass a written test about transporting hazardous materials. To pass the test, you must know how to:

- Identify what are hazardous materials.
- Safely load shipments.
- Properly placard your vehicle in accordance with the rules.
- Safely transport shipments.

Learn the rules and follow them. Following the rules reduces the risk of injury from hazardous materials. Taking shortcuts by breaking rules is unsafe. Rule breakers can be fined and put in jail.

Inspect your vehicle before and during each trip. Law enforcement officers may stop and inspect your vehicle. When stopped, they may check your shipping papers, vehicle placards, the hazardous materials endorsement on your driver's license, and your knowledge of hazardous materials.

## 9.2 Hazardous Materials Transportation --Who Does What

### The Shipper

- Sends products from one place to another by truck, rail, vessel, or airplane.
- Uses the hazardous materials regulations to determine the product's:
  - Proper shipping name
  - Hazard class

- Identification number
- Correct packaging
- Correct label and markings
- Correct placards

- Must package, mark, and label the materials; prepare shipping papers; provide emergency response information; and supply placards.
- Certify on the shipping paper that the shipment has been prepared according to the rules (unless you are pulling cargo tanks supplied by you or your employer).

#### The Carrier:

- Takes the shipment from the shipper to its destination.
- Prior to transportation, checks that the shipper correctly described, marked, labeled, and otherwise prepared the shipment for transportation.
- Refuses improper shipments.
- Reports accidents and incidents involving hazardous materials to the proper government agency.

#### The Driver:

- Makes sure the shipper has identified, marked, and labeled the hazardous materials properly.
- Refuses leaking packages and shipments.
- Placards his vehicle when loading, if required.
- Safely transports the shipment without delay.
- Follows all special rules about transporting hazardous materials.
- Keeps hazardous materials shipping papers and emergency response information in the proper place.

## 9.3 Communication Rules

Some words and phrases have special meanings when talking about hazardous materials. Some of these may differ from meanings you are used to. The words and phrases in this section may be on your test. The meanings of other important words are in the [glossary](#) at the end of Section 9.

A material's **hazard class** reflects the risks associated with it. There are 9 different hazard classes. Figure 9-1 tells the exact meaning of each hazard class. The types of materials included in these 9 classes are in the table below.

| Class | Division | Name of Class or Division | Example           |
|-------|----------|---------------------------|-------------------|
| 1     | 1.1      | Mass Explosives           | Dynamite          |
|       | 1.2      | Projection Hazards        | Flares            |
|       | 1.3      | Mass Fire Hazards         | Display Fireworks |
|       | 1.4      | Minor Hazards             | Ammunition        |
|       | 1.5      | Very Insensitive          | Blasting Agents   |
|       | 1.6      | Extremely Insensitive     | Explosive Devices |

|      |                   |   |   |
|------|-------------------|---|---|
| 2    | 2.1<br>2.2<br>2.3 | Flammable Gases<br>Non-Flammable Gases<br>Poisonous/Toxic Gases                     | Propane<br>Helium<br>Fluorine, Compressed             |
| 3    | --                | Flammable Liquids   | Gasoline  |
| 4    | 4.1<br>4.2<br>4.3 | Flammable Solids<br>Spontaneously Combustible<br>Spontaneously Combustible When Wet | Ammonium Picrate<br>Wetted White Phosphorus<br>Sodium |
| 5    | 5.1<br>5.2        | Oxidizers<br>Organic Peroxides  | Ammonium Nitrate<br>Methyl Ethyl Ketone Peroxide      |
| 6    | 6.1<br>6.2        | Poison (Toxic Material)<br>Infectious Substances                                    | Potassium Cyanide<br>Anthrax Virus                    |
| 7    | --                | Radioactive   | Uranium   |
| 8    | --                | Corrosives  | Battery Fluid   |
| 9    | --                | Miscellaneous Hazardous Materials   | Polychlorinated Biphenyls (PCB)                       |
| None | --                | ORM-D (Other Regulated Material-Domestic)   | Food Flavorings, Medicines                            |
| None | --                | Combustible Liquids   | Fuel Oil  |

Figure 9-1 Hazardous Materials Hazard Class/Division Table

A **shipping paper** describes the hazardous materials being transported. Shipping orders, bills of lading, and manifests are all shipping papers. Figure 9-6 shows an example shipping paper.

After an accident or hazardous materials spill or leak, you may be injured and unable to communicate the hazards of the materials you are transporting. Firefighters and police can prevent or reduce the amount of damage or injury at the scene if they know what hazardous materials are being carried. Your life, and the lives of others, may depend on quickly locating the hazardous materials shipping papers. For that reason the rules:

- Require shippers to describe hazardous materials correctly and include an emergency response telephone number on shipping papers.
- Require carriers and drivers to put tabs on hazardous materials shipping papers, or keep them on top of other shipping papers and keep the required emergency response information with the shipping papers.
- Require drivers to keep hazardous materials shipping papers:
  - In a pouch on the driver's door, or
  - In clear view within immediate reach while the seat belt is fastened while driving, or
  - On the driver's seat when out of the vehicle.

## Package Labels

Shippers put diamond-shaped hazard warning labels on most hazardous materials packages. These labels inform others of the hazard. If the diamond label won't fit on the package, shippers may put the label on a tag securely attached to the package. For example, compressed gas cylinders that will not hold a label will have tags or decals. Labels look like the example in Figure 9-2.

## Lists of Regulated Products

**Placards** are used to warn others of hazardous materials. Placards are signs put on the outside of a vehicle which identify the hazard class of the cargo. A placarded vehicle must have at least 4 identical placards. They are put on the front, rear, and both sides of the vehicle (see Figure 9-3). Placards must be readable from all four directions. They are 10 3/4 inches square, square-on-point, in a diamond shape. Cargo tanks and other bulk packaging display the I.D. number of their contents on placards or orange panels or white square-on-point displays that are the same size as placards.

Hazardous material identification numbers may be displayed on placards or orange panels.

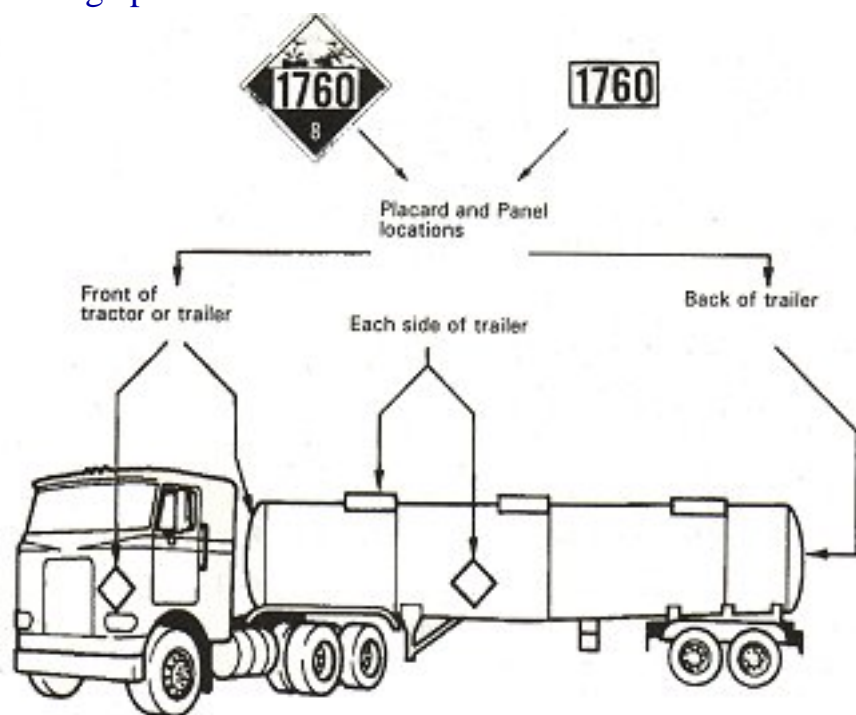


Figure 9-3

There are three main lists used by shippers, carriers, and drivers when trying to identify hazardous materials. Before transporting a material, look for its name on three lists. Some materials are on all lists, others on only one. Always check the following lists:

- Section 172.101, the Hazardous Materials Table,
- Appendix A to Section 172.101, the List of Hazardous Substances and Reportable Quantities, and
- Appendix B to Section 172.101, the List of Marine Pollutants.

**The Hazardous Materials Table.** Figure 9-4 shows part of the Hazardous Materials Table. Column 1 tells which shipping mode(s) the entry affects and other information concerning the shipping description. The next five columns show each material's shipping name, hazard class or division, ID number,



packaging group, and required labels.

Five different symbols may appear in Column 1 of the table.

(+) Shows the proper shipping name, hazard class, and packing group to use, even if the material doesn't meet the hazard class definition.

(A) Means the hazardous material described in Column 2 is subject to the HMR only when offered or intended for transport by air unless it is a hazardous substance or hazardous waste.

(W) Means the hazardous material described in Column 2 is subject to the HMR only when offered or intended for transportation by water unless it is a hazardous substance, hazardous waste, or marine pollutant.

(D) Means the proper shipping name is appropriate for describing materials for domestic transportation, but may not be proper for international transportation.

(I) Identifies a proper shipping name that is used to describe materials in international transportation. A different shipping name may be used when only domestic transportation is involved.

Column 2 lists the proper shipping names and descriptions of regulated materials. Entries are in alphabetical order so you can more quickly find the right entry. The table shows proper shipping names in regular type. The shipping paper must show proper shipping names. Names shown in *italics* are not proper shipping names.

Column 3 shows a material's hazard class or division, or the entry "Forbidden" material. Never transport a "Forbidden" material. You placard shipments based on the quantity and hazard class. You can decide which placards to use if you know these three things:

Material's hazard class.

- Amount being shipped.
- Amount of all hazardous materials of all classes on your vehicle.

Column 4 lists the identification number for each proper shipping name. Identification numbers are preceded by the letters "UN" or "NA." The letters "NA" are associated with proper shipping names that are only used within the United States and to and from Canada. The identification number must appear on the shipping paper as part of the shipping description and also appear on the package. It also must appear on cargo tanks and other bulk packaging. Police and firefighters use this number to quickly identify the hazardous materials.

| 172.101 Hazardous Materials Table |   |                                 |                               |                      |  |                           |  |                             |                         |
|-----------------------------------|---|---------------------------------|-------------------------------|----------------------|--|---------------------------|--|-----------------------------|-------------------------|
| Symbol<br>(1)                     | Hazardous materials descriptions and proper shipping names<br>(2) | Hazard class or Division<br>(3) | Identification Numbers<br>(4) | Packing Group<br>(5) | Label(s) required (if not expected)<br>(6) | Special provisions<br>(7) | Packaging authorizations<br>173.***<br>(8) |                             |                         |
|                                   |   |                                 |                               |                      |  |                           | Excep-<br>tions<br>(8A)                    | NON Bulk Pacakaging<br>(8B) | Bulk Pack-aging<br>(8C) |

|    |  |     |         |   |                                   |         |      |     |     |
|----|--|-----|---------|---|-----------------------------------|---------|------|-----|-----|
| -- | Poisonous solids, self heating, n.o.s... | 6.1 | UIN3124 | I | POISON, SPONTANEOUSLY COMBUSTIBLE | A5_____ | None | 211 | 241 |
|----|--|-----|---------|---|-----------------------------------|---------|------|-----|-----|

Figure 9-4  
 Part of the Hazardous Materials Table

Column 5 shows the packing group assigned to a material.

Column 6 shows the hazard warning label(s) shippers must put on packages of hazardous materials. Some products require use of more than one label due to a dual hazard being present. No label is needed where the table shows the word NONE.

Column 7 lists the additional (special) provisions that apply to this material. When there is an entry in this column, you must refer to the federal regulations for specific information.

Column 8 is a three-part column showing the section numbers covering the packaging requirements for each hazardous material.

**Note:** Columns 9 and 10 do not apply to transportation by highway.

**Appendix A to 172.101 - The List of Hazardous Substances and Reportable Quantities.** The DOT and the EPA want to know about spills of **hazardous substances**. They are named in the List of Hazardous Substances and Reportable Quantities (see Figure 9-5). Column 3 of the list shows each product's reportable quantity (RQ). When these materials are being transported in a reportable quantity or greater in one package, the shipper displays the letters RQ on the shipping paper and package. The letters RO may appear before or after the basic description. You or your employer must report any spill of these materials which occurs in a **reportable quantity**.

If the words INHALATION HAZARD appear on the shipping paper or package, the rules require display of the POISON or POISON GAS placards, as appropriate. These placards must be used in addition to other placards which may be required by the product's hazard class. Always display the hazard class placard and the POISON placard, even for small amounts.

Spills of 10 pounds or more must be reported.

| LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES - Continued |          |  |
|--|----------|--|
| Hazardous Substance  | Synonyms | Reportable Quantity (RQ)<br>Pounds (Kilograms) |
|  |          |  |

|                            |                                     |               |
|----------------------------|-------------------------------------|---------------|
| Phenyl mercaptan 0         | Benzinethiol                        | 100 (45.4)    |
| Phenylmercuric acetate     | Thiophenol                          |               |
| N-Phenylthiourea           | Mercury, (acetato-0) phenyl         | 100 (45.4)    |
| Phorate                    | Thiourea, phenyl                    | 100 (45.4)    |
|                            | Phosphorodithioic acid, O,O-diethyl |               |
|                            | S-(ethylthio), methylester          | 10 4.5        |
| Phosgene                   | Carbonyl chloride                   | <u>10 4.5</u> |
| Phosphine                  | Hydrogen Phosphide                  | 100 (45.4)    |
| Phosphoric acid            |                                     | 5000 (2270)   |
| Phosphroic acid, diethyl   |                                     |               |
| 4-nitro phenyl ester       | Diethyl-p nitrophenyl phosphate     | 100 (45.4)    |
| Phosphoric acid, lead salt | Lead phosphate                      | 1 (0.454)     |

Figure 9-5  
List of Hazardous Substances

### Test Your Knowledge

1. Shippers package in order to (fill in the blank) the material.
2. Drivers placard their vehicle to (fill in the blank) the risk.
3. What three things do you need to know to decide which placards (if any) you need?
4. A hazardous materials ID number must appear on the (fill in the blank) and on the (fill in the blank). The identification number must also appear on cargo tanks and other bulk packagings.
5. Where must you keep shipping papers describing hazardous materials?

*These questions may be on your test. If you can't answer them all, re-read Section 9.1 - 9.3*

### The Shipping Paper

The shipping paper shown in Figure 9-6 describes a shipment. A shipping paper for hazardous materials must include:

- Page numbers if the shipping paper has more than one page. The first page must tell the total number of pages. For example, "Page 1 of 4."
- A proper shipping description for each hazardous material.
- A "**shipper's certification**," signed by the shipper, saying they prepared the shipment according to the rules.

### The Item Description

If a shipping paper describes both hazardous and non-hazardous products, the hazardous materials will be either:

- Described first, or
- Highlighted in a contrasting color, or
- Identified by an "X" placed before the shipping name in a column captioned "HM." The letters "RQ" may be used instead of "X" if a reportable quantity is present in one package.

The basic description of hazardous materials includes the proper shipping name, hazard class or division, the identification number, and the packing group, if any, in that order. The packing group is displayed in Roman numerals and may be preceded by "PG."

Shipping name, hazard class, and ID number must not be abbreviated unless specifically authorized in the hazardous materials regulations. The description must also show:

- The total quantity and unit of measure, and
- The letters RQ, if a reportable quantity.
- If the letters RQ appear, the name of the hazardous substance.
- For "n.o.s." and generic descriptions, the technical name of the hazardous material.

|   |   |  |   |
|---|---|--|---|
| SHIPPING PAPER  |   | Page 1 of 1  |   |
| TO:   | Wafers R US<br>88 Valley Street<br>Silicon Junction, CA | FROM:  | Essex Corporation<br>5775 Dawson Avenue<br>Coleta, CA 93117 |
| QTY   | HM  | DESCRIPTION  | WEIGHT  |
| 1 cyl   | <u>RQ</u>   | <u>Phosgene, 2.3, UN1076,</u><br>Poison, Inhalation<br>Hazard, Zone CA | <u>25 lbs</u>   |
| This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. |   |  |   |
| Shipper:  | Essex Corp  | Carrier:   | Knuckle Bros.   |
| Per:  | Shultz  | Per:   |   |
| Date:   | 6/27/88   | Date:  |   |
| SPECIAL INSTRUCTIONS: 24 Hr. Emergency Contact, Ed Shultz, 1-800-555-5555   |   |  |   |

Figure 9-6  
Example of Shipping Paper

"RQ" means that this is a reportable quantity

Hazard Class from Column 3 of the Table

Proper shipping name from Column 2 of the Hazardous

ID Number from Column 4 of the Hazardous Materials Table Materials Table

Shipping papers also must list an emergency response telephone number. The emergency response telephone number is the responsibility of the shipper. It can be used by emergency responders to obtain information about any hazardous materials involved in a spill or fire.

Shippers also must provide emergency response information to the motor carrier for each hazardous material being shipped. The emergency response information must be able to be used away from the motor vehicle and must provide information on how to safely handle incidents involving the material. It must include information on the shipping name of the hazardous materials, risks to health, fire,

explosion, and initial methods of handling spills, fires, and leaks of the materials.

Such information can be on the shipping paper or some other document that includes the basic description and technical name of the hazardous material. Or, it may be in a guidance book such as the Emergency Response Guidebook (ERG). Motor carriers may assist shippers by keeping an ERG on each vehicle carrying hazardous materials. The driver must provide the emergency response information to any federal, state, or local authority responding to a hazardous materials incident or investigating one.

Total quantity must appear before or after the basic description. The packaging type and the unit of measurement may be abbreviated. For example:

10 ctns. Paint, 3, UN1263, PG II, 500 lbs.

The shipper of hazardous wastes must put the word WASTE before the proper shipping name of the material on the shipping paper (hazardous waste manifest). For example:

Waste Acetone, 3, UN1090, PG 11.

A non-hazardous material may not be described by using a hazard class or an ID number.

### **Shipper's Certification**

When the shipper packages hazardous materials, he/she certifies that the package has been prepared according to the rules. The signed shipper's certification appears on the original shipping paper. The only exceptions are when a shipper is a private carrier transporting their own product and when the package is provided by the carrier (for example, a cargo tank). Unless a package is clearly unsafe or does not comply with the HMR, you may accept the shipper's certification concerning proper packaging. Some carriers have additional rules about transporting hazardous materials. Follow your employer's rules when accepting shipments.

### **Package Markings and Labels**

Shippers print required markings directly on the package, an attached label, or tag. An important package marking is the name of the hazardous materials. It is the same name as the one on the shipping paper. When required, the shipper will put the following on the package:

- The name and address of shipper or consignee.
- The hazardous material's shipping name and ID number.
- The labels required.

If the rules require it, the shipper also will put RQ or INHALATION-HAZARD on the package. Packages with liquid containers inside will also have package orientation markings with the arrows pointing in the correct upright direction. The labels used always reflect the hazard class of the product. If a package needs more than one label, the labels will be close together, near the proper shipping name.

### **Recognizing Hazardous Materials**

Learn to recognize shipments of hazardous materials. To find out if the shipment includes hazardous materials, look at the shipping paper. Does it have:

- An entry with a proper shipping name, hazard class, and ID number?

- A highlighted entry, or one with an X or RQ in the hazardous materials column?

Other clues suggesting hazardous materials:

- What business is the shipper in? Paint dealer? Chemical supply? Scientific supply house? Pest control or agricultural supplier? Explosives, munitions, or fireworks dealer?
- Are there tanks with diamond labels or placards on the premises?
- What type of package is being shipped? Cylinders and drums are often used for hazardous materials shipments.
- Is a hazard class label, proper shipping name, or ID number on the package?
- Are there any handling precautions?

## **Hazardous Waste Manifest**

When transporting hazardous wastes, you must sign by hand and carry a Uniform Hazardous Waste Manifest. The name and EPA registration number of the shippers, carriers, and destination must appear on the manifest. Shippers must prepare, date, and sign by hand the manifest. Treat the manifest as a shipping paper when transporting the waste. Only give the waste shipment to another registered carrier or disposal/treatment facility. Each carrier transporting the shipment must sign by hand the manifest. After you deliver the shipment, keep your copy of the manifest. Each copy must have all needed signatures and dates, including those of the person to whom you delivered the waste.

## **Placarding**

Attach the appropriate placards to the vehicle before you drive it. You are only allowed to move an improperly placarded vehicle during an emergency, in order to protect life or property.

Placards must appear on both sides and ends of the vehicle. Each placard must be:

- Easily seen from the direction it faces.
- Placed so the words or numbers are level and read from left to right.
- At least 3 inches away from any other markings.
- Kept clear of attachments or devices such as ladders, doors, and tarpaulins.
- Kept clean and undamaged so that the color, format, and message are easily seen.

To decide which placards to use, you need to know:

- The hazard class of the materials.
- The amount of hazardous materials shipped.
- The total weight of all classes of hazardous materials in your vehicle.

Always make sure that the shipper shows the correct basic description on the shipping paper and verifies that the proper labels are shown on the packages. If you are not familiar with the material, ask the shipper to contact your office.

## **Placard Tables**

There are two placard tables, Table 1 and Table 2. Table 1 materials must be placarded whenever any amount is transported.



# PLACARD TABLE 1 - ANY AMOUNT

IF YOUR VEHICLE CONTAINS ANY AMOUNT OF... PLACARD AS...

|                                       |                    |
|---------------------------------------|--------------------|
| 1.1                                   | EXPLOSIVE 1.1      |
| 1.2                                   | EXPLOSIVE 1.2      |
| 1.3                                   | EXPLOSIVE 1.3      |
| 2.3                                   | POISON GAS         |
| 4.3                                   | DANGEROUS WHEN WET |
| 6.1 (PG I, inhalation hazard only)    | POISON             |
| 7 (Radioactive Yellow III label only) | RADIOACTIVE        |

Except for bulk packagings, the hazard classes in Table 2 need placards only if the total amount transported is 1,001 lbs or more including the package. Add the amounts from all shipping papers for all the Table 2 products you have on board. You may use DANGEROUS placards instead of separate placards for each Table 2 hazard class when:

- You have 1,001 lbs or more of two or more Table 2 hazard classes, requiring different placards, and
- You have not loaded 5,000 lbs or more of any Table 2 hazard class material at any one place. (You must use the specific placard for this material.)

If the words INHALATION HAZARD are on the shipping paper or package, you must display POISON placards in addition to any other placards needed by the product's hazard class.

You need not use EXPLOSIVES 1.5, OXIDIZER, and DANGEROUS placards if a vehicle contains Division 1.1 or 1.2 explosives and is placarded with EXPLOSIVES 1.1 or 1.2 placards. You need not use a Division 2.2 NON-FLAMMABLE GAS placard on a vehicle displaying a Division 2.1 FLAMMABLE GAS or for oxygen a Division 2.2 OXYGEN placard.

Placards used to identify the primary hazard class of a material must have the hazard class or division number displayed in the lower corner of the placard. No hazard class or division number is allowed on placards used to identify a secondary hazard class of a material.

Placards may be displayed for hazardous materials even if not required so long as the placard identifies the hazard of the material being transported.

## PLACARD TABLE 2 - 1,001 LBS OR MORE

| Category of Material (Hazard class or division number and additional description, as appropriate) | Placard Name   |
|---|----------------|
| 1.4   | EXPLOSIVES 1.4 |
| 1.5   | EXPLOSIVES 1.5 |
| 1.6   | EXPLOSIVES 1.6 |



|   |                           |
|---|---------------------------|
| 2.1   | FLAMMABLE GAS             |
| 2.2   | NON-FLAMMABLE GAS         |
| 3   | FLAMMABLE                 |
| Combustible liquid                                  | COMBUSTIBLE *             |
| 4.1   | FLAMMABLE SOLID           |
| 4.2   | SPONTANEOUSLY COMBUSTIBLE |
| 5.1   | OXIDIZER                  |
| 5.2   | ORGANIC PEROXIDE          |
| 6.1 (PG I or II, other than PG 1 inhalation hazard) | POISON                    |
| 6.1 (PG III)  | KEEP AWAY FROM FOOD       |
| 6.2   | (NONE)                    |
| 8   | CORROSIVE                 |
| 9   | CLASS 9 **                |
| ORM-D   | (NONE)                    |

\* FLAMMABLE placard may be used in place of a COMBUSTIBLE placard on a cargo tank or portable tank.

\*\* Class 9 Placard is not required for domestic transportation.

### Test Your Knowledge

1. What is a shipper's certification? Where does it appear? Who signs it?
2. When may non-hazardous materials be described by hazard class words or ID numbers?
3. Name five hazard classes that require placarding in **any** amount.
4. A shipment described on the Hazardous Waste Manifest may only be delivered to another (fill in the blank) carrier or treatment facility, which then signs the (fill in the blank) giving you a copy which you must keep.
5. Your load includes 20 lbs of Division 2.3 gas and 1,001 lbs of flammable gas. What placards do you need, if any?

*These questions may be on your test. If you can't answer them all, re-read Section 9.3*

# Section 10: Pre-Trip Vehicle Inspection Test

During the pre-trip inspection, you must show that the vehicle is safe to drive. You may have to walk around the vehicle and point to or touch each item and explain to the examiner what you are checking and why. You will NOT have to crawl under the hood or under the vehicle.

## 10.1 All Vehicles

Study the following vehicle parts for the type of vehicle you will be using during the CDL skills tests. You should be able to identify each part and tell the examiner what you are looking for or inspecting.

### Engine Compartment (Engine Off)

#### Leaks/Hoses

- Look for puddles on the ground.
- Look for dripping fluids on underside of engine and transmission.
- Inspect hoses for condition and leaks.

#### Oil Level

- Indicate where dipstick is located.
- See that oil level is within safe operating range. Level must be above refill mark.

#### Coolant Level

- Inspect reservoir sight glass, or
- (If engine is not hot), remove radiator cap and check for visible coolant level.

#### Power Steering Fluid

- Indicate where power steering fluid dipstick is located.
- Check for adequate power steering fluid level. Level must be above refill mark.

#### Engine Compartment Belts

- Check the following belts for snugness (up to 3/4 inch play at center of belt), cracks, or frays:
  - Power steering belt.
  - Water pump belt.
  - Alternator belt.
  - Air compressor belt.

**Note: If any of the components listed above are not belt driven, you must:**

- Tell the examiner which component(s) are not belt driven.
- Make sure component(s) are operating properly, are not damaged or leaking, and are mounted securely.

### Cab Check/Engine Start

### Clutch/Gearshift

- Depress clutch.
- Place gearshift lever in neutral (or park, for automatic transmissions).
- Start engine, then release clutch slowly.

### Oil Pressure Gauge

- Make sure oil pressure gauge is working.
- Check that pressure gauge shows increasing or normal oil pressure or that the warning light goes off.
- If equipped, oil temperature gauge should begin a gradual rise to the normal operating range.

### Temperature Gauge

- Make sure the temperature gauge is working.
- Temperature should begin to climb to the normal operating range or temperature light should be off.

### Ammeter/Voltmeter

- Check that gauges show alternator and/or generator is charging or that warning light is off.

### Mirrors and Windshield

- Mirrors should be clean and adjusted properly from the inside.
- Windshield should be clean with no illegal stickers, no obstructions, or damage to the glass.

### Emergency Equipment

- Check for spare electrical fuses.
- Check for three red reflective triangles.
- Check for a properly charged and rated fire extinguisher.

**Note: If the vehicle is not equipped with electrical fuses, you must mention this to the examiner.**

### Steering Play

- **Non-power steering:** Check for excessive play by turning steering wheel back and forth. Play should not exceed 10 degrees (or about two inches on a 20-inch wheel).
- **Power steering:** With the engine running, check for excessive play by turning the steering wheel back and forth. Play should not exceed 10 degrees (or about two inches on a 20-inch wheel) before front left wheel barely moves.

### Wipers/Washers

- Check that wiper arms and blades are secure, not damaged, and operate smoothly.
- If equipped, windshield washers must operate correctly.

### Lighting Indicators

- Test that dash indicators work when corresponding lights are turned on:

- Left turn signal.
- Right turn signal.
- 4-way emergency flashers.
- High beam headlight.

## Horn

- Check that air horn and/or electric horn work.

## Heater/Defroster

- Test that the heater and defroster work.

## Parking Brake Check

- Apply parking brake only and make sure that it will hold the vehicle by shifting into a lower gear and gently pulling against the brake.

## Hydraulic Brake Check

- Pump the brake pedal three times, then hold it down for five seconds. The brake pedal should not move (depress) during the five seconds.
- If equipped with a hydraulic brake reserve (back-up) system, with the key off, depress the brake pedal and listen for the sound of the reserve system electric motor.
- Check that the warning buzzer or light is off.

## Air Brake Check (air brake equipped vehicles only)

- Failure to perform an air brake check will result in an automatic failure of the Vehicle Inspection Test. Air brake safety devices vary. However, this procedure is designed to see that any safety device operates correctly as air pressure drops from normal to a low air condition. For safety purposes, in areas where an incline is present, you will use wheel chocks during the air brake check. The proper procedures for inspecting the air brake system are as follows:

--With the engine running, build the air pressure to governed cut-out (100-125 PSI). Shut off the engine, chock your wheels, if necessary, release the tractor protection valve and parking brake (push in), fully apply the foot brake and hold it for one minute. Check the air gauge to see if the air pressure drops more than three (3) pounds in one minute (**single vehicle**) or four (4) pounds in one minute (**combination vehicle**).

--Begin fanning off the air pressure by rapidly applying and releasing the foot brake. Low air warning devices (buzzer, light, flag) should activate before air pressure drops below 60 PSI.

--Continue to fan off the air pressure. At approximately 40 PSI on a tractor-trailer combination vehicle, the tractor protection valve and parking brake valve should close (pop out). On other combination vehicle types and single vehicle types, the parking brake valve should close (pop out).

## Safety Belt

- Check that the safety belt is securely mounted, adjusts, and latches properly.

### Lights/Reflectors

- Check that all external lights and reflective equipment are clean and functional. Light and reflector checks include:
  - Clearance lights (red on rear, amber elsewhere).
  - Headlights (high and low beams).
  - Taillights.
  - Turn signals.
  - 4-way flashers.
  - Brake lights.
  - Red reflectors (on rear) and amber reflectors (elsewhere).
- **Note: Checks of brake, turn signal and four-way flasher functions must be done separately.**

## 10.2 External Inspection (School Bus/Truck/Tractor)

### Steering

#### Steering Box/Hoses

- Check that the Steering box is securely mounted and not leaking. Look for any missing nuts, bolts, and cotter keys.
- Check for power steering fluid leaks or damage to power steering hoses.

#### Steering Linkage

- See that connecting links, arms, and rods **from the steering box to the wheel** are not worn or cracked.
- Check that joints and sockets are not worn or loose and that there are no missing nuts, bolts, or cotter keys.

### Suspension

#### Springs/Air/Torque

- Look for missing, shifted, cracked, or broken leaf springs.
- Look for broken or distorted coil springs.
- If vehicle is equipped with torsion bars, torque arms, or other types of suspension components, check that they are not damaged and are mounted securely.
- Air ride suspension should be checked for damage and leaks.

#### Mounts

- Look for cracked or broken spring hangers, missing or damaged bushings, and broken, loose, or missing bolts, U- bolts or other axle mounting parts. (The mounts should be checked at each point where they are secured to the vehicle frame and axle[s]).

#### Shock Absorbers

- See that shock absorbers are secure and that there are no leaks.

**Note: Be prepared to perform the same suspension components inspection on every axle (power unit and trailer, if equipped).**

## **Brakes**

### Slack Adjustors

- Look for broken, loose, or missing parts.
- The angle between the push rod and adjustor arm should be a little over 90 degrees when the brakes are released, and not less than 90 degrees when the brakes are applied.
- When pulled by hand, the brake rod should not move more than one inch (with the brakes released).

### Brake Chambers

- See that brake chambers are not leaking, cracked, or dented and are mounted securely.

### Brake Hoses/Lines

- Look for cracked, worn, or leaking hoses, lines, and couplings.

### Drum Brake

- Check for cracks, dents, or holes. Also check for loose or missing bolts.
- Brake linings (where visible) should not be worn dangerously thin.

### Brake Linings

- On some brake drums, there are openings where the brake linings can be seen from outside the drum. For this type of drum, check that a visible amount of brake lining is showing.

**Note: Be prepared to perform the same brake components inspection on every axle (power unit and trailer, if equipped).**

## **Wheels**

### Rims

- Check for damaged or bent rims. Rims cannot have welding repairs.

### Tires

- The following items must be inspected on every tire:

--**Tread depth:** Check for minimum tread depth (4/32 on steering axle tires, 2/32 on all other tires).

--**Tire condition:** Check that tread is evenly worn and look for cuts or other damage to tread or sidewalls. Also, make sure that valve caps and stems are not missing, broken, or damaged.

--**Tire inflation:** Check for proper inflation by using a tire gauge, or inflation by striking tires with a mallet or other similar device.

**Note:** You **will not** get credit if you simply kick the tires to check for proper inflation.

### Hub Oil Seals/Axle Seals

- See that hub oil/grease seals and axle seals are not leaking and, if wheel has a sight glass, oil level is adequate.

### Lug Nuts

- Check that all lug nuts are present, free of cracks and distortions, and show no signs of looseness such as rust trails or shiny threads.
- Make sure all bolt holes are not cracked or distorted.

### Spacers

- If equipped, check that spacers are not bent, damaged, or rusted through.
- Spacers should be evenly centered, with the dual wheels and tires evenly separated.

**Note: Be prepared to perform the same wheel inspection on every axle (power unit and trailer, if equipped).**

## **Side of Vehicle**

### Door(s)/Mirror(s)

- Check that door(s) are not damaged and that they open and close properly from the outside.
- Hinges should be secure with seals intact.
- Check that mirror(s) and mirror brackets are not damaged and are mounted securely with no loose fittings.

### Fuel Tank

- Check that tank(s) are secure, cap(s) are tight, and that there are no leaks from tank(s) or lines.

### Battery/Box

- Wherever located, see that battery(s) are secure, connections are tight, and cell caps are present.
- Battery connections should not show signs of excessive corrosion.
- Battery box and cover or door must be secure.

### Drive Shaft

- See that drive shaft is not bent or cracked.
- Couplings should be secure and free of foreign objects.

### Exhaust System

- Check system for damage and signs of leaks such as rust or carbon soot.
- System should be connected tightly and mounted securely.

### Frame

- Look for cracks, broken welds, holes or other damage to the longitudinal frame members, cross members, box, and floor.



## **Rear of Vehicle**

### Splash Guards

- If equipped, check that splash guards or mud flaps are not damaged and are mounted securely.

### Doors/Ties/Lifts

- Check that doors and hinges are not damaged and that they open, close, and latch properly from the outside, if equipped.
- Ties, straps, chains, and binders must also be secure.
- If equipped with a cargo lift, look for leaking, damaged or missing parts and explain how it should be checked for correct operation.
- Lift must be fully retracted and latched securely.

## **Tractor/Coupling**

### Air/Electric Lines

- Listen for air leaks. Check that air hoses and electrical lines are not cut, chafed, spliced, or worn (steel braid should not show through).
- Make sure air and electrical lines are not tangled, pinched, or dragging against tractor parts.

### Catwalk

- Check that the catwalk is solid, clear of objects, and securely bolted to tractor frame.

### Mounting Bolts

- Look for loose or missing mounting brackets, clamps, bolts, or nuts. Both the fifth wheel and the slide mounting must be solidly attached.
- On other types of coupling systems (i.e., ball hitch, pintle hook, etc.), inspect all coupling components and mounting brackets for missing or broken parts.

### Locking Jaws

- Look into fifth wheel gap and check that locking jaws are fully closed around the kingpin.
- On other types of coupling systems (i.e., ball hitch, pintle hook, etc.), inspect the locking mechanism for missing or broken parts and make sure it is locked securely. If present, safety cables or chains must be secure and free of kinks and excessive slack.

### Platform (fifth wheel)

- Check for cracks or breaks in the platform structure which supports the fifth wheel skid plate.

### Release Arm (fifth wheel)

- If equipped, make sure the release arm is in the engaged position and the safety latch is in place.

### Kingpin/Apron/Gap

- Check that the kingpin is not bent.
- Make sure the visible part of the apron is not bent, cracked, or broken.
- Check that the trailer is laying flat on the fifth wheel skid plate (no gap).

### Locking Pins (fifth wheel)

- If equipped, look for loose or missing pins in the slide mechanism of the sliding fifth wheel. If air powered, check for leaks.
- Make sure locking pins are fully engaged.
- Check that the fifth wheel is positioned properly so that the tractor frame will clear the landing gear during turns.

## **10.3 School Bus Only**

### Emergency Equipment

- In addition to checking for spare electrical fuses (if equipped), three red reflective triangles, and a properly charged and rated fire extinguisher, school bus drivers must also inspect the following emergency equipment:
  - Three red-burning flares (fusees), and
  - A nine-item first-aid kit.

### Lighting Indicators

- In addition to checking the lighting indicators listed in Section 10.2 of this manual, school bus drivers must also check the following (external) lights and reflectors:
  - Strobe light, if equipped.
  - Alternately flashing amber lights, if equipped.
  - Alternately flashing red lights indicator.

### Lights/Reflectors

- In Addition to checking the lights and reflective devices listed in Section 10.2 of this manual, school bus drivers must also check the following (external) lights and reflectors.
  - Strobe light, if equipped.
  - Stop arm light, if equipped.
  - Alternately flashing amber lights, if equipped.
  - Alternately flashing red lights.

### Stop Arm

- If equipped, check the stop arm to see that it is mounted securely to the frame of the vehicle. Also, check for loose fittings and damage.

### Passenger Entry/Lift

- Check that the entry door is not damaged, operates smoothly, and closes securely from the inside.
- Hand rails are secure and the step light is working, if equipped.
- The entry steps must be clear with the treads not loose or worn excessively.
- If equipped with a handicap lift, look for leaking, damaged, or missing parts and explain how lift should be checked for correct operation. Lift must be fully retracted and latched securely.

### Emergency Exit

- Make sure that all emergency exits are not damaged, operate smoothly, and close securely from the inside.
- Check that any emergency exit warning devices are working.

### Seating

- Look for broken seat frames and check that seat frames are firmly attached to the floor.
- Check that seat cushions are attached securely to the seat frames.

## **10.4 Trailer**

### **Trailer Front**

#### Air/Electrical Connections

- Check that trailer air connectors are sealed and in good condition.
- Make sure glad hands are locked in place, free of damage or air leaks.
- Make sure the trailer electrical plug is firmly seated and locked in place.

#### Header Board

- If equipped, check the header board to see that it is secure, free of damage, and strong enough to contain cargo.
- If equipped, the canvas or tarp carrier must be mounted and fastened securely.
- On enclosed trailers, check the front area for signs of damage such as cracks, bulges, or holes.

### **Side of Trailer**

#### Landing Gear

- Check that the landing gear is fully raised, has no missing parts, crank handle is secure, and the support frame is not damaged.
- If power operated, check for air or hydraulic leaks.

#### Doors/Ties/Lifts

- If equipped, check that doors are not damaged. Check that doors open, close, and latch properly from the outside.
- Check that ties, straps, chains, and binders are secure.
- If equipped with a cargo lift, look for leaking, damaged or missing parts and explain how it should be checked for correct operation.
- Lift should be fully retracted and latched securely.

#### Frame

- Look for cracks, broken welds, holes or other damage to the frame, cross members, box, and floor.

#### Tandem Release Arm/Locking Pins

- If equipped, make sure the locking pins are locked in place and release arm is secured.

## **Remainder of Trailer**

- Please refer to Section 10.2 of this manual for detailed inspection procedures regarding the following components:
  - Wheel
  - Suspension system.
  - Brakes.
  - Doors/Ties/Lift.
  - Splash Guards.

## **10-5 Coach/Transit Bus**

### **Passenger Items**

#### Passenger Entry/Lift

- Check that entry doors operate smoothly and close securely from the inside.
- Check that hand rails are secure and, if equipped, that the step light(s) are working.
- Check that the entry steps are clear, with the treads not loose or worn excessively.
- If equipped with a handicap lift, look for any leaking, damaged or missing part, and explain how it should be checked for correct operation.
- Lift should be fully retracted and latched securely.

#### Emergency Exits

- Make sure that all emergency exits are not damaged, operate smoothly, and close securely from the inside.
- Check that any emergency exit warning devices are working.

#### Passenger Seating

- Look for broken seat frames and check that seat frames are firmly attached to the floor.
- Check that seat cushions are attached securely to the seat frames.

### **Entry/Exit**

#### Doors/Mirrors

- Check that entry/exit doors are not damaged and operate smoothly from the outside. Hinges should be secure with seals intact.
- Make sure that the passenger exit mirrors and all external mirrors and mirror brackets are not damaged and are mounted securely with no loose fittings.

### **External Inspection of Coach/Transit Bus**

#### Level/Air Leaks

- See that the vehicle is sitting level (front and rear), and if air-equipped, check for audible air leaks

from the suspension system.

### Fuel Tank(s)

- See that fuel tank(s) are secure with no leaks from tank(s) or lines.

### Compartments

- Check that baggage and all other exterior compartment doors are not damaged, operate properly, and latch securely.

### Battery/Box

- Wherever located, see that battery(s) are secure, connections are tight, and cell caps are present.
- Battery connections should not show signs of excessive corrosion.
- Check that battery box and cover or door is not damaged and is secure.

### **Remainder of Coach/Transit Bus**

#### Remainder of Vehicle

- Please refer to Section 10.2 of this manual for detailed inspection procedures regarding the following components:
  - Wheels.

**Remember, the Pre-Trip Vehicle Inspection must be passed before you can proceed to the Basic Vehicle Control Skills Test.**

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# Section 11: Basic Vehicle Control Skills Test

Your basic control skills could be tested using one or more of the following exercises off-road or somewhere on the street during the road test:

- Forward stop.
- Straight line backing.
- Alley dock.
- Parallel park (driver side).
- Parallel park (conventional).
- Right turn.
- Backward serpentine.

## 11.1 Scoring

### Crossing Boundaries

The examiner will score the number of times you touch or cross over an exercise boundary line with any portion of your vehicle. Each encroachment will count as an error.

### Pull-ups

In some of the exercises, the examiner will also score the number of times you stop and change direction or pull-up during the exercise. Errors will be explained to you prior to the beginning of each exercise.

## 11.2 Exercises

### Forward Stop

You may be asked to drive forward between two rows of cones and bring your vehicle to a complete stop as close as you can to the exercise boundary marked by an end line or set of cones (without going beyond the line or cones).

### Straight Line Backing

You may be asked to back your vehicle in a straight line between two rows of cones without touching or crossing over the exercise boundaries.

### Alley Dock

You may be asked to sight-side back your vehicle into an alley, bringing the rear of your vehicle as close as possible to the rear of the alley without going beyond the exercise boundary marked by a line or row of cones.

### Parallel Park (Driver Side)

You may be asked to park in a parallel parking space that is on your left. You are to drive past the parking space and back into it bringing the rear of your vehicle as close as possible to the rear of the



space without crossing side or rear boundaries marked by cones. You are to try to get your vehicle (or trailer, if combination vehicle) completely into the space.

### **Parallel Park (Conventional)**

You may be asked to park in a parallel parking space that is on your right. You are to drive past the parking space and back into it bringing the rear of your vehicle as close as possible to the rear of the space without crossing side or rear boundaries marked by cones. You are to try to get your vehicle (or trailer, if combination vehicle) completely into the space.

### **Right Turn**

You may be asked to drive forward and make a right turn around a cone. You should try to bring the right rear wheel(s) of your vehicle as close to the base of the cone as possible without hitting it.

### **Backward Serpentine**

You may be asked to back your vehicle through a 3-cone serpentine without touching any cones or crossing over the exercise (side) boundaries marked by cones.

**Remember, you must pass the Pre-Trip Vehicle Inspection and the Basic Vehicle Control Skills Test before proceeding to the On Road Driving Test.**

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# Section 12: On Road Driving Test

You will drive over a test route that has a variety of traffic situations. At all times during the test, you must drive in a safe and responsible manner.

During the driving test, the examiner will be scoring you on specific driving maneuvers as well as on your general driving behavior. You will follow the directions of the examiner. Directions will be given to you so you will have plenty of time to do what the examiner has asked. You will not be asked to drive in an unsafe manner.

If your test route does not have certain traffic situations, you may be asked to simulate a traffic situation. You will do this by telling the examiner what you are or would be doing if you were in that traffic situation.

## 12.1 How You Will Be Tested

### Turns

You have been asked to make a turn:

- Check traffic in all directions.
- Use turn signals and safely get into the lane needed for the turn.

As you approach the turn:

- Use turn signals to warn others of your turn.
- Slow down smoothly, change gears as needed to keep power, but do not coast unsafely. Unsafe coasting occurs when your vehicle is out of gear (clutch depressed or gearshift in neutral) for more than the length of your vehicle.

If you must stop before making the turn:

- Come to a smooth stop without skidding.
- Come to a complete stop behind the stop line, crosswalk, or stop sign.
- If stopping behind another vehicle, stop where you can see the rear tires on the vehicle ahead of you (safe gap).
- Do not let your vehicle roll.
- Keep the front wheels aimed straight ahead.

When ready to turn:

- Check traffic in all directions.
- Keep both hands on the steering wheel during the turn.
- Do not change gears during the turn.
- Keep checking your mirror to make sure the vehicle does not hit anything on the inside of the turn.
- Vehicle should not move into oncoming traffic.
- Vehicle should finish turn in correct lane.

After turn:

- Make sure turn signal is off.
- Get up to speed of traffic, use turn signal, and move into right-most lane when safe to do so (if not already there).

## **Intersections**

As you approach an intersection:

- Check traffic thoroughly in all directions.
- Decelerate gently.
- Brake smoothly and, if necessary, change gears.
- If necessary, come to a complete stop (no coasting) behind any stop signs, signals, sidewalks, or stop lines maintaining a safe gap behind any vehicle in front of you.
- Your vehicle must not roll forward or backward.

When driving through an intersection:

- Check traffic thoroughly in all directions.
- Decelerate and yield to any pedestrians and traffic in the intersection.
- Do not change lanes or shift gears while proceeding through the intersection.
- Keep your hands on the wheel.

Once through the intersection:

- Continue checking traffic.
- Accelerate smoothly and change gears as necessary.

## **Urban/Rural Straight**

During this part of the test, you are expected to make regular traffic checks and maintain a safe following distance. Your vehicle should be centered in the proper lane (right-most lane) and you should keep up with the flow of traffic but not exceed the posted speed limit.

## **Urban/Rural Lane Changes**

During the multiple lane portion of the urban and rural sections, you will be asked to change lanes to the left, and then back to the right. You should make the necessary traffic checks first, then use proper signals and smoothly change lanes when it is safe to do so.

## **Expressway**

Before entering the expressway:

- Check traffic.
- Use proper signals.
- Merge smoothly into the proper lane of traffic.

Once on the expressway:

- Maintain proper lane positioning, vehicle spacing, and vehicle speed.
- Continue to check traffic thoroughly in all directions.

You will be instructed to change lanes:

- You must make necessary traffic checks.
- Use proper signals.
- Change lanes smoothly when it is safe to do so.

When exiting the expressway:

- Make necessary traffic checks.
- Use proper signals.
- Decelerate smoothly in the exit lane.
- Once on the exit ramp, you must continue to decelerate within the lane markings and maintain adequate spacing between your vehicle and other vehicles.

## **Stop/Start**

For this maneuver, you will be asked to pull your vehicle over to the side of the road and stop as if you were going to get out and check something on your vehicle. You must check traffic thoroughly in all directions and move to the right-most lane or shoulder of road.

As you prepare for the stop:

- Check traffic.
- Activate your right turn signal.
- Decelerate smoothly, brake evenly, change gears as necessary.
- Bring your vehicle to a full stop without coasting.

Once stopped:

- Vehicle must be parallel to the curb or shoulder of the road and safely out of the traffic flow.
- Vehicle should not be blocking driveways, fire hydrants, intersections, signs, etc.
- Cancel your turn signal.
- Activate your four-way emergency flashers.
- Apply the parking brake.
- Move the gear shift to neutral or park.
- Remove your feet from the brake and clutch pedals.

**When instructed to resume:**

- Check traffic and your mirrors thoroughly in all directions.
- Turn off your four-way flashers.
- Activate the left turn signal.
- When traffic permits, you should release the parking brake and pull straight ahead.
- Do not turn the wheel before your vehicle moves.

- Check traffic from all directions, especially to the left.
- Steer and accelerate smoothly into the proper lane when safe to do so.
- Once your vehicle is back into the flow of traffic, cancel your left turn signal.

## Curve

When approaching a curve:

- Check traffic thoroughly in all directions.
- **Before** entering the curve, reduce speed so further braking or shifting is not required in the curve.
- Keep vehicle in the lane.
- Continue checking traffic in all directions.

## Upgrade

As you approach the upgrade:

- Select the proper gear to maintain speed and not lug the engine.
- Check traffic thoroughly in all directions and move to the right-most or curb lane.
- If legal to do so, use four-way flashers if traveling too slowly for the flow of traffic.

## Downgrade

Before starting down the grade:

- Downshift as needed to help control engine speed and test brakes by gently applying the foot brake to ensure they are functioning properly. As your vehicle moves down the grade, continue checking traffic in all directions, stay in the right-most or curb lane, and, if legal to do so, use four-way flashers if your vehicle is moving too slowly for traffic. Increase following distance and observe the following downhill braking procedures:

--Select a "safe" speed, one that is not too fast for the weight of the vehicle, length and steepness of the grade, weather, and road conditions.

--Once a "safe" speed has been reached, apply the brake hard enough to feel a definite slowdown.

--When speed has been reduced to 5 m.p.h. below the "safe" speed, release the brakes. (This application should last for about three (3) seconds.)

--Once speed has increased to the "safe" speed, repeat the procedure.

**For example**, if your "safe" speed is 40 m.p.h., you should apply the brakes once your vehicle speed reaches 40 m.p.h. Your brakes should be applied hard enough to reduce your speed to 35 m.p.h. Once your vehicle speed reaches 35 m.p.h., release your brakes. Repeat this procedure as often as necessary until you have reached the end of the downgrade. This braking technique is called "snubbing."

When operating any commercial vehicle, do not ride the clutch, race the engine, change gears, or coast while driving down the grade. At the bottom of the grade, be sure to cancel your four-way flashers.

Not all test routes will contain an area of sufficient grade to test your skill adequately. **Therefore, you may be asked to simulate (verbally) driving up and down a steep hill.** You must be familiar with the upgrade/downgrade procedures so that you can explain and/or demonstrate them to the examiner at any time during the driving test.

## **Railroad Crossing**

**Before** reaching the crossing, all commercial drivers should:

- Decelerate, brake smoothly, and shift gears as necessary.
- Look and listen for the presence of trains.
- Check traffic in all directions.

**Do not** stop, change gears, pass another vehicle, or change lanes while any part of your vehicle is in the crossing.

If you are driving a bus, a school bus, or a vehicle displaying placards, you should be prepared to observe the following procedures at every railroad crossing (unless the crossing is exempt):

- As the vehicle approaches a railroad crossing, activate the four-way flashers.
- Stop the vehicle within 50 feet but not less than 15 feet from the nearest rail.
- Listen and look in both directions along the track for an approaching train and for signals indicating the approach of a train. If operating a bus, you may also be required to open the window and door prior to crossing tracks.
- Keep hands on the steering wheel as the vehicle crosses the tracks.
- Do not stop, change gears, or change lanes while any part of your vehicle is proceeding across the tracks.
- Four-way flashers should be deactivated after the vehicle crosses the tracks.

**Not all driving road test routes will have a railroad crossing. You may be asked to explain and demonstrate the proper railroad crossing procedures to the examiner at a simulated location.**

## **Bridge/Overpass/Sign**

After driving under an overpass, you may be asked to tell the examiner what the posted clearance or height was. After going over a bridge, you may be asked to tell the examiner what the posted weight limit was. If your test route does not have a bridge or overpass, you may be asked about another traffic sign. When asked, be prepared to identify and explain to the examiner any traffic sign which may appear on the route.

During the driving test you must:

- Wear your safety belt.
- Obey all traffic signs, signals, and laws.
- Complete the test without an accident or moving violation.

You will be scored on your overall performance in the following general driving behavior categories:

Clutch Usage (for manual transmission)



- Always use clutch to shift.
- Double-clutch if vehicle is equipped with non-synchronized transmission.
- Do not rev or lug the engine.
- Do not ride clutch to control speed, coast with the clutch depressed, or "pop" the clutch.

#### Gear Usage (for manual transmission)

- Do not grind or clash gears.
- Select gear that does not rev or lug engine.
- Do not shift in turns and intersections.

#### Brake Usage

- Do not ride or pump brake.
- Do not brake harshly. Brake smoothly using steady pressure.

#### Lane Usage

- Do not put vehicle over curbs, sidewalks, or lane markings.
  - Stop behind stop lines, crosswalks, or stop signs.
  - Complete a turn in the proper lane on a multiple lane road (vehicle should finish a left turn in the lane directly to the right of the center line).
  - Finish a right turn in the right-most (curb) lane.
  - Move to or remain in right-most lane unless lane is blocked.
- 

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**Table A:Radioactive Seperation Table(Note: You will not be tested on the numbers in this table.)**

Do not leave radioactive yellow - II or yellow - III labeled packages near people, animals, or film longer than shown in this table.

| TOTAL<br>TRANSPORT INDEX | MINIMUM DISTANCE IN FEET TO NEAREST<br>UNDEVELOPED FILM |              |              |               |                  | TO PEOPLE OR CARGO<br>COMPARTMENT T<br>PARTITION |
|--------------------------|---|--------------|--------------|---------------|------------------|--|
|                          | 0-2<br>Hours  | 2-4<br>Hours | 4-8<br>Hours | 8-12<br>Hours | Over 12<br>Hours |  |
| None                     | 0   | 0            | 0            | 0             | 0                | 0  |
| 0.1 to 1.0               | 1   | 2            | 3            | 4             | 5                | 1  |
| 1.1 to 5.0               | 3   | 4            | 6            | 8             | 11               | 2  |
| 5.1 to 10.0              | 4   | 6            | 9            | 11            | 15               | 3  |
| 10.1 to 20.0             | 5   | 8            | 12           | 16            | 22               | 4  |
| 20.1 to 30.0             | 7   | 10           | 15           | 20            | 29               | 5  |
| 30.1 to 40.0             | 8   | 11           | 17           | 22            | 33               | 6  |
| 40.1 to 50.0             | 9   | 12           | 19           | 24            | 36               |  |

**Table B: TABLE OF HAZARD CLASS DEFINITIONS(Note: You will not be tested on this table.)**

**Kinds of Hazardous Materials**

Hazardous materials are categorized into nine major hazard classes and additional categories for consumer commodities and combustible liquids. The classes of hazardous materials are as follows:

| CLASS | CLASS NAME       | EXAMPLE                             |
|-------|------------------|-------------------------------------|
| 1     | Explosives       | Ammunition, Dynamite, Fireworks     |
| 2     | Gases            | Propane, Oxygen, Helium             |
| 3     | Flammable        | Gasoline Fuel, Acetone              |
| 4     | Flammable Solids | Matches, Fusees                     |
| 5     | Oxidizers        | Ammonium Nitrate, Hydrogen Peroxide |
| 6     | Poisons          | Pesticides, Arsenic                 |
| 7     | Radioactive      | Uranium, Plutonium                  |

|      |   |                                  |
|------|---|----------------------------------|
| 8    | Corrosives                                | Hydrochloric Acid, Battery Acid  |
| 9    | Miscellaneous Hazardous                   | Formaldehyde, Asbestos Materials |
| None | ORM-D (Other Regulated Material-Domestic) | Hair Spray or Charcoal           |
| None | Combustible Liquids                       | Fuel Oils, Lighter Fluid         |

## Hazardous Materials Glossary

This glossary presents definitions of certain terms used in this section. A complete glossary of terms can be found in the federal Hazardous Materials Rules (49 CFR 171.8). You should have an up-to-date copy of these rules for your reference.

**(Note: You will not be tested on this glossary.)**

Sec. 171.8 Definitions and abbreviations.

**Bulk packaging** means a packaging, other than a vessel, or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form of containment and which has:

1. A maximum capacity greater than 450 L (119 gallons) as a receptacle for a liquid;
2. A maximum net mass greater than 400 kg (882 pounds) or a maximum capacity greater than 450 L (119 gallons) as a receptacle for a solid; or
3. A water capacity greater than 454 kg (1000 pounds) as a receptacle for a gas as defined in Sec. 173.115.

**Cargo tank** means a bulk packaging which:

1. Is a tank intended primarily for the carriage of liquids or gases and includes appurtenances, reinforcements, fittings, and closures (for "tank," see 49 CFR 178.345-1(c), 178.337-1, or 178.338-1, as applicable);
2. Is permanently attached to or forms a part of a motor vehicle, or is not permanently attached to a motor vehicle but which, by reason of its size, construction, or attachment to a motor vehicle is loaded or unloaded without being removed from the motor vehicle; and
3. Is not fabricated under a specification for cylinders, portable tanks, tank cars, or multi-unit tank car tanks.

**Carrier** means a person engaged in the transportation of passengers or property by:

1. Land or water as a common, contract, or private carrier, or
2. Civil aircraft.

**Consignee** means the business or person to whom a shipment is delivered.

**Division** means a subdivision of a hazard class.

**EPA** means U.S. Environmental Protection Agency.

**FMCSR** means the Federal Motor Carrier Safety Regulations.

**Freight container** means a reusable container having a volume of 64 cubic feet or more, designed and constructed to permit being lifted with its contents intact and intended primarily for containment of packages (in unit form) during transportation.

**Fuel tank** means a tank, other than a cargo tank, used to transport flammable or combustible liquid or compressed gas for the purpose of supplying fuel for propulsion of the transport vehicle to which it is attached, or for the operation of other equipment on the transport vehicle.

**Gross weight or Gross mass** means the weight of a packaging plus the weight of its contents.

**Hazard class** means the category of hazard assigned to a hazardous material under the definitional criteria of Part 173 and the provisions of the Sec. 172.101 Table. A material may meet the defining criteria for more than one hazard class but is assigned to only one hazard class.

**Hazardous materials** means a substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. The term includes hazardous substances, hazardous wastes, marine pollutants, and elevated temperature materials as defined in this section, materials designated as hazardous under the provisions of Sec. 172.101 and 172.102, and materials that meet the defining criteria for hazard classes and divisions in Part 173.

**Hazardous substance** means a material, including its mixtures and solutions, that:

1. Is listed in Appendix A to Sec. 172.101;
2. Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in Appendix A to Sec. 172.101; and
3. When in a mixture or solution --
  - i. For radionuclides, conforms to paragraph 6 of Appendix A to Sec. 172.101.
  - ii. For other than radionuclides, is in a concentration by weight which equals or exceeds the concentration corresponding to the RQ of the material, as shown in the following table:

| RQ POUNDS (KILOGRAMS) | CONCENTRATION BY WEIGHT |         |
|-----------------------|-------------------------|---------|
|                       | Percent                 | PPM     |
| 5,000 (2270)          | 10                      | 100,000 |
| 1,000 (454)           | 2                       | 20,000  |
| 100 (45.4)            | 0.2                     | 2,000   |
| 10 (4.54)             | 0.02                    | 200     |
| 1 (0.454)             | 0.002                   | 20      |

This definition does not apply to petroleum products that are lubricants or fuels (see 40 CFR 300.6).

**Hazardous waste**, for the purposes of this chapter, means any material that is subject to the Hazardous Waste Manifest Requirements of the U.S. Environmental Protection Agency specified in 40 CFR Part 262.

**Limited quantity**, when specified as such in a section applicable to a particular material, means the maximum amount of a hazardous materials for which there may be specific labeling or packaging exception.

**Marking** means the descriptive name, identification number, instructions, cautions, weight, specification, or UN marks or combinations thereof, required by this subchapter on outer packagings of hazardous materials.

**Mixture** means a material composed of more than one chemical compound or element.

**Name of contents** means the proper shipping name as specified in Sec. 172.101.

**Non-bulk packaging** means a packaging which has:

1. A maximum capacity of 450 L (119 gallons) as a receptacle for a liquid;
2. A maximum net mass less than 400 kg (882 pounds) and a maximum capacity of 450 L (119 gallons) or less as a receptacle for a solid; or
3. A water capacity greater than 454 kg (1,000 pounds) or less as a receptacle for a gas as defined in Sec. 173.115.

**N.O.S.** means not otherwise specified.

**Outsge or ullage** means the amount by which a packaging falls short of being liquid full, usually expressed in percent by volume.

**Portable tank** means a bulk packaging (except a cylinder having a water capacity of 1000 pounds or less) designed primarily to be loaded onto, or on, or temporarily attached to a transport vehicle or ship and equipped with skids, mountings, or accessories to facilitate handling of the tank by mechanical means. It does not include a cargo tank, tank car, multi-unit tank car tank, or trailer carrying 3AX, 3AAX, or 3T cylinders.

**Proper shipping** name means the name of the hazardous materials shown in Roman print (not italics) in Sec. 172.101.

**P.s.i. or psi** means pounds per square inch.

**P.s.i.e. or psia** means pounds per square inch absolute.

**Reportable quantity (RQ)** means the quantity specified in Column 3 of the Appendix to Sec. 172.101 for any material identified in Column 1 of the Appendix.

**RSPA** means the Research and Special Programs Administration, U.S. Department of Transportation,

Washington, DC 20590.

**Shipper's certification** means a statement on a shipping paper, signed by the shipper, saying he/she prepared the shipment properly according to law.

"This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations or the Department of Transportation." or "I hereby declare that the contents of this consignment are fully and accurately described above the proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by " according to applicable international and national government regulations."

- words may be inserted here to indicate mode of transportation (rail, aircraft, motor vehicle, vessel}

**Shipping paper** means a shipping order, bill of lading, manifest, or other shipping document serving a similar purpose and containing the information required by Sec. 172.202, 172.203, and 172.204.

**Technical name** means a recognized chemical name or microbiological name currently used in scientific and technical handbooks, journals, and texts.

**Transport vehicle** means a cargo-carrying vehicle such as an automobile, van, tractor, truck, semi-trailer, tank car, or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (trailer, rail car, etc.) is a separate transport vehicle.

**UN standard packaging** means a specification packaging conforming to the requirements in Subpart L and M of Part 178.

**UN** means United Nations.

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## **3 Transporting Cargo**



## **4 Transporting Passengers**



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